

Watershed Restoration and Protection Strategy



Smoky Hill River Kanopolis Lake Watershed

Stakeholder Committee

Smoky Hill River Task Force

**Brad Kratzer
Ruth Shiltz
Robert Binder
Todd Wasinger
Allen Roth
J. Neil Jednoralski
Judy Duryee
Lance Russell
Mort Sherfick
Bradley Zweifel
Steve Soukup
Loran Zimmerman**

Agency Advisors

**Stacie Minson, Watershed Specialist, Kansas State Research and Extension
Ken Urban, Ellis County, Natural Resource Conservation Service
Mike Grogan, Trego County, Natural Resource Conservation Service
Andy Phelps, Russell County, Natural Resource Conservation Service
Philip Chegwiddden, Ellsworth County, Natural Resource Conservation Service
Sandi Scott, Ellis County Conservation District
Judy Kreutzer, Trego County Conservation District
Donna Fay Major, Russell County Conservation District
Pamela Hays, Ellsworth County Conservation District
Brad Kratzer, Ellsworth County Conservation District
Stacy Campbell, Ellis County, Kansas State Research and Extension
Amy Taylor, Trego County, Kansas State Research and Extension
John Stannard, Russell County, Kansas State Research and Extension
Brent Goss, Ellsworth County, Kansas State Research and Extension
Brenden Wirth, Kansas Farm Bureau
William Hargrove, Kansas State Research and Extension
Robert Wilson, Kansas State Research and Extension
Daniel Devlin, Kansas State Research and Extension
Kyle Mankin, Kansas State Research and Extension
Don Snethen, Kansas Department of Health and Environment
Doug Schneweis, Kansas Department of Health and Environment
David Gurss, Kansas Department of Health and Environment
Carol Blocksom, Kansas State Research and Extension
Susan Brown, Kansas State Research and Extension**

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Middle Smoky Hill River (HUC 10260006) and Big Creek (HUC 10260007) Watershed Restoration and Protection Strategy Report

Section 1 Introduction

The purpose of a Watershed Restoration and Protection Strategy (WRAPS) report for Big Creek Watershed and Middle Smoky Hill River Watershed, which contains Kanopolis Lake, is to outline a plan of restoration and protection goals and actions for the surface and ground waters of the watershed. Water quality goals are characterized as “restoration” or “protection”. Restoration is needed in waters that do not meet water quality standards. Protection goals are needed to ensure that the current health of the water does not deteriorate.

The WRAPS development process involves local communities and governmental agencies working together toward the common goal of a healthy environment. Local participants or stakeholders provide valuable grass roots leadership, responsibility and management of resources in the process. They have the most “at stake” in ensuring the water quality existing on their land is protected. Agencies bring science-based information, education, communication, and technical and financial assistance to the table. Together, several steps can be taken towards watershed restoration and protection. These steps involve building awareness and education, engaging local leadership, monitoring and evaluation, in addition to assessment, planning, and implementation of the WRAPS process at the local level. Final goals for the watershed at the end of the WRAPS process are to provide a sustainable water source for drinking and domestic use while preserving food, fiber, and timber production. Other crucial objectives are to maintain recreational opportunities and biodiversity while protecting the environment from flooding, urbanization, and industrial production. The ultimate goal is watershed restoration and protection that will be “locally led and driven” in conjunction with government agencies in order to better the environment for everyone.

This WRAPS report contains the following subdivisions for each watershed:

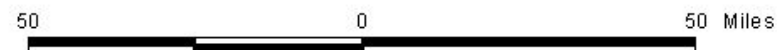
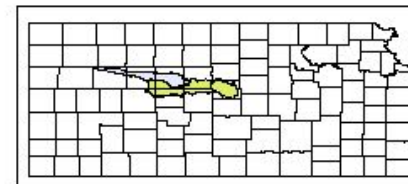
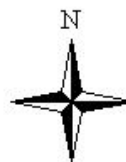
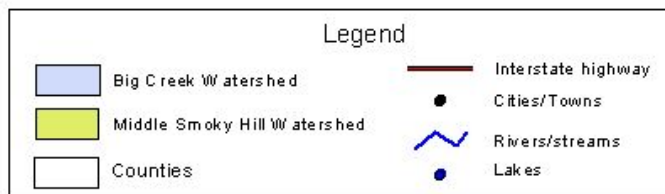
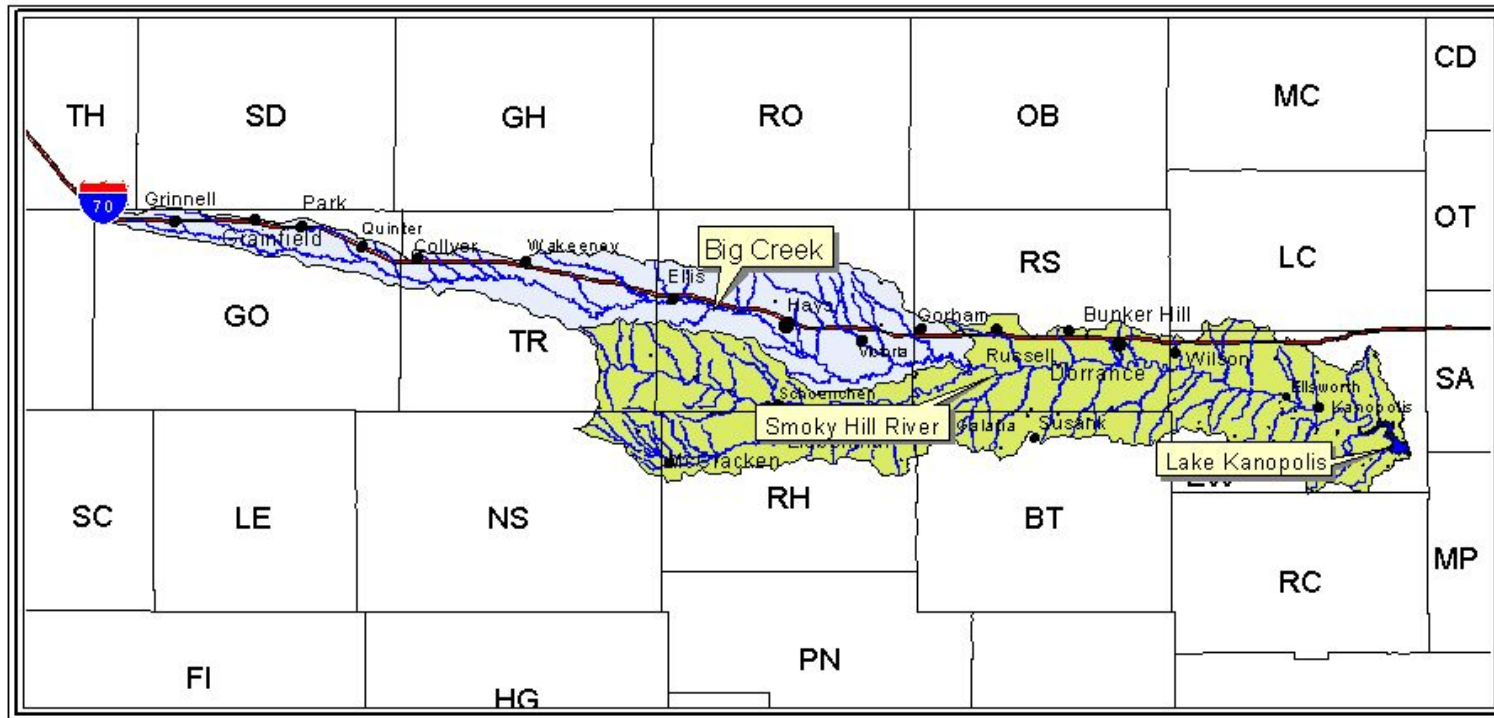
- Identification and discussion of the watershed setting, uses, water quality, and resources.
- Overview of current water quality conditions in specific river and stream segments and lakes.
- A review of public participation and education.

Joint discussion of the two watersheds is covered in the following sections:

- Water quality goals determined by local participants as important objectives, and actions with subsequent costs that can be implemented for the attainment of these goals.
- An appendix containing specific monetary funding that has been received in order to improve the water quality of the watershed.

This report is designed as a reference for local groups and public officials that are intent upon restoring and protecting the water quality of Big Creek and Middle Smoky Hill watersheds (Figure 1).

Figure 1. Big Creek (HUC 10260007) and Middle Smoky Hill Watersheds (HUC 10260006)



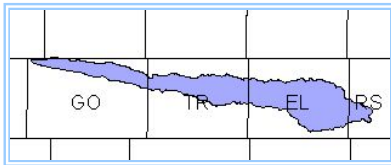
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Big Creek Watershed

I. Watershed setting

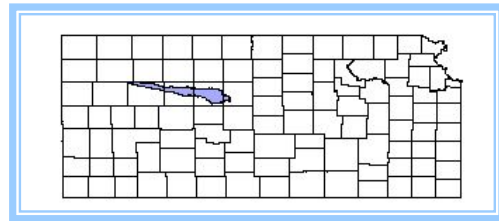
A. Location

The Big Creek Watershed covers portions of Gove, Trego, Ellis, and Russell counties in western Kansas. It covers 852 square miles which includes 321 stream miles and 28 acres of lakes. The Big Creek Watershed drains to the Big Creek and Big Creek North Fork and their tributaries. Many of the stream segments have seasonal flow. Big Creek originates in Gove County west of the town of Grinnell and travels in an easterly direction to its convergence with the Smoky Hill River southwest of Russell. Big Creek Oxbow Lake is located within the city limits of Hays and Ellis City Lake lies within the city limits of Ellis.



in

Counties:
GO=Gove
TR=Trego
EL=Ellis
RS=Russell



Major cities the watershed are Ellis (pop. 1,873) 2000 US people live density of

and Hays (pop. 20,013) according to the Census Bureau. Approximately 41,264 in the counties that contain the watershed with an average population 11.4 persons per square mile. The Kansas state average is 32.9 persons per square mile. Population has decreased in the counties of the watershed by 3.25 percent from 2000 to 2002 (US Census Bureau).

B. Water Resources and Uses

The predominant waterway in the watershed is Big Creek (Figure 2). Other streams that flow into Big Creek are Walker, Mud, Big Creek North Fork, Chetolah, and Ogallah Creeks. Many minor streams and creeks only flow during seasonal rainfall events. Annual rainfall averages range from 19 to 28 inches and a 24-hour, 25-year rainfall event is approximately 4.8 inches. The streams and their tributaries are generally used to support aquatic life (fish), and to provide water for domestic uses (drinking water), recreation (fishing, boating, swimming), and livestock. Lakes in the Big Creek Watershed are used for aquatic life support, food procurement (fishing), and primary and secondary contact recreation (swimming and boating). These are commonly referred to as “designated uses”.

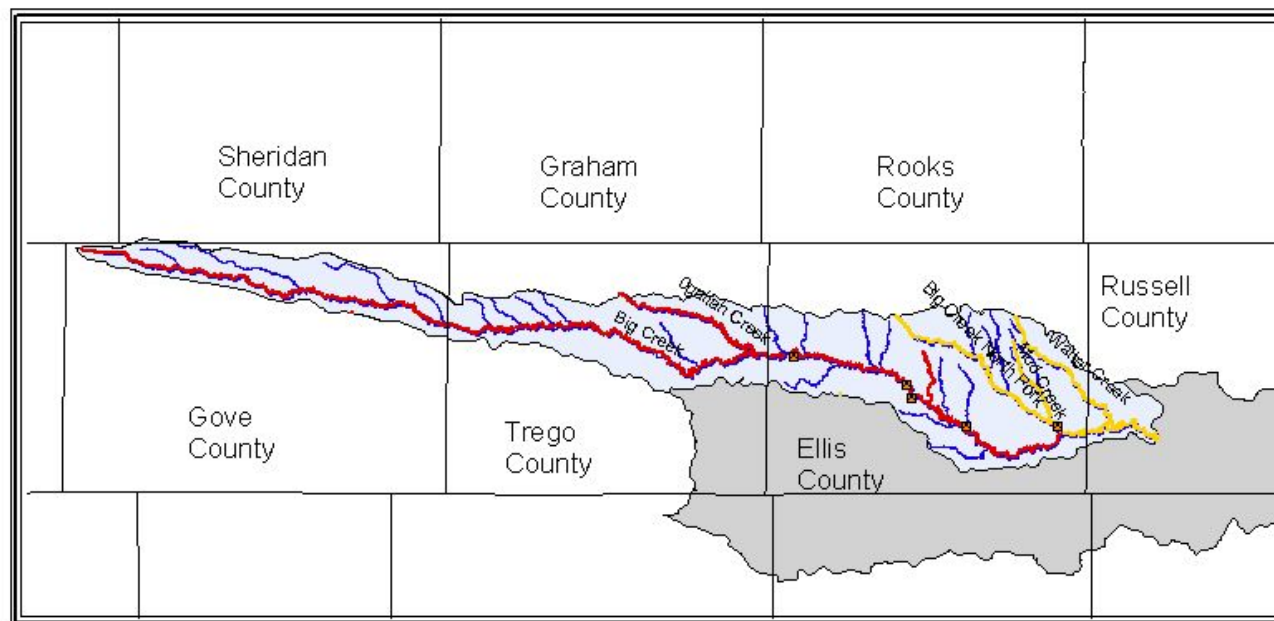
Two stream monitoring sites are located on Big Creek and one on the North Fork of Big Creek, while Ellis City Lake and Big Creek Oxbow Lake each contain one monitoring site.



Wastewater treatment facilities are permitted and regulated through KDHE (Kansas Department of Health and Environment). National Pollutant Discharge Elimination System (NPDES) permits specify the maximum amount of pollutants allowed to be discharged to surface waters. The municipal and industrial wastewater treatment facilities along Big Creek and its tributaries are marked in Figure 3. Thousands of septic systems exist in the watershed.

City of WaKeeney Water Treatment Plant

Figure 2. Big Creek Watershed (HUC 10260007) Water Resources and Impairments



Surface Waters with TMDL Listings

Watersheds

- Big Creek
- Middle Smoky Hill

- Rivers/Streams
- KDHE Monitoring Sites

Water Quality Impairments

- High Priority TMDL
- Medium/Low Priority TMDL

The TMDLs shown on this map should be considered draft in nature.
TMDL data provided by the Kansas Department of Health and Environment.

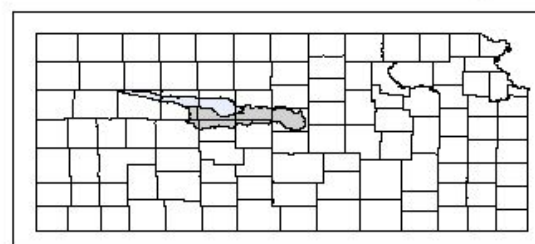
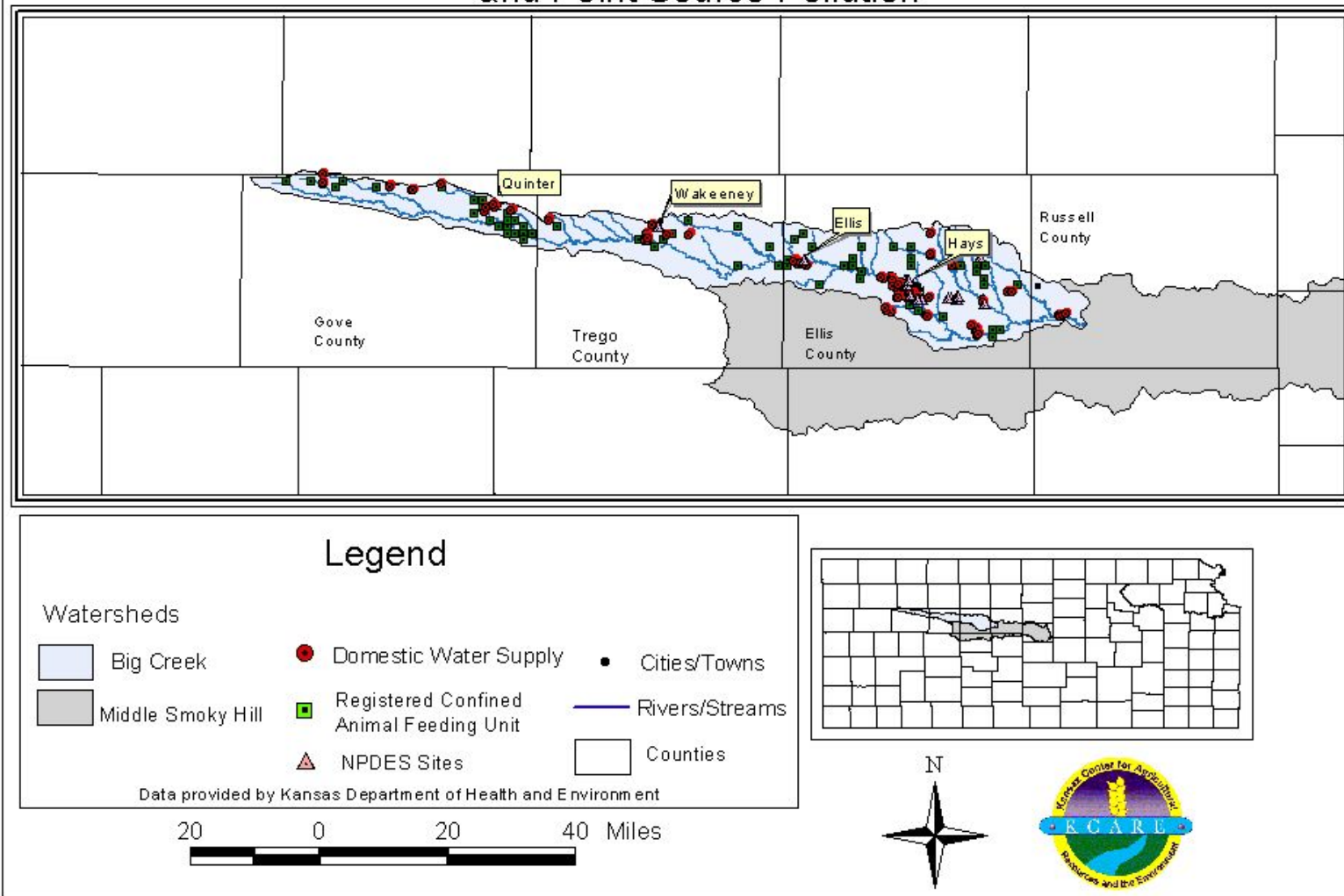


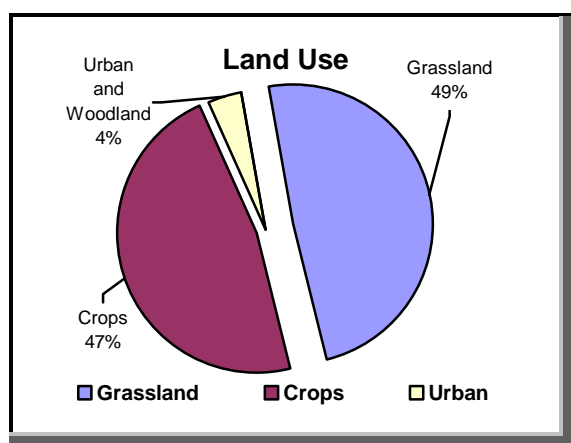
Figure 3. Big Creek Watershed (HUC 10260007) Water Resources and Point Source Pollution



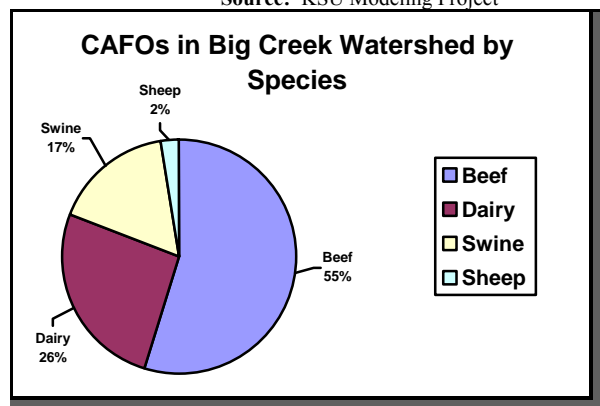
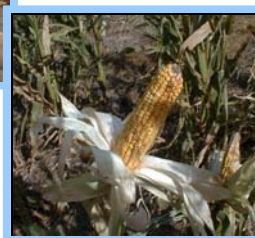
Three groundwater aquifers lie beneath this watershed. They are the High Plains Aquifer, the Dakota Aquifer and the shallow Alluvial Aquifers of the streams and creeks throughout the Big Creek area (Figure 4). There are 134 public water supplies that draw their drinking water from the aquifers in addition to thousands of private wells (estimated number of private wells in the city of Hays is 2,500). Water from these wells is used for domestic use, lawn and garden, monitoring, irrigation, and livestock sources. Irrigation is the primary use of water from the High Plains Aquifer.

C. Land Use

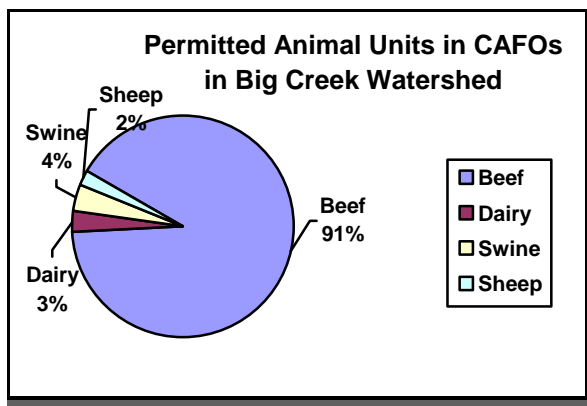
Land use activities can have a significant impact on the types and quantity of nonpoint source pollutants in the watershed. The primary land uses in the watershed are grasslands (49%), crop production (47%), urban areas and woodlands (4%). See Figure 5. The main crops grown are wheat and sorghum. At the current time, there are approximately forty (21 beef, 11 dairy, 7 swine, and 1 sheep) Confined Animal Feeding Operations (CAFOs) permitted by KDHE in the watershed. These permitted facilities are allowed to contain 44,927 animal units or AU (equal standards for all animals based on size and manure production; 1 AU = 700 pounds). See Figure 3.



Source: KSU Modeling Project

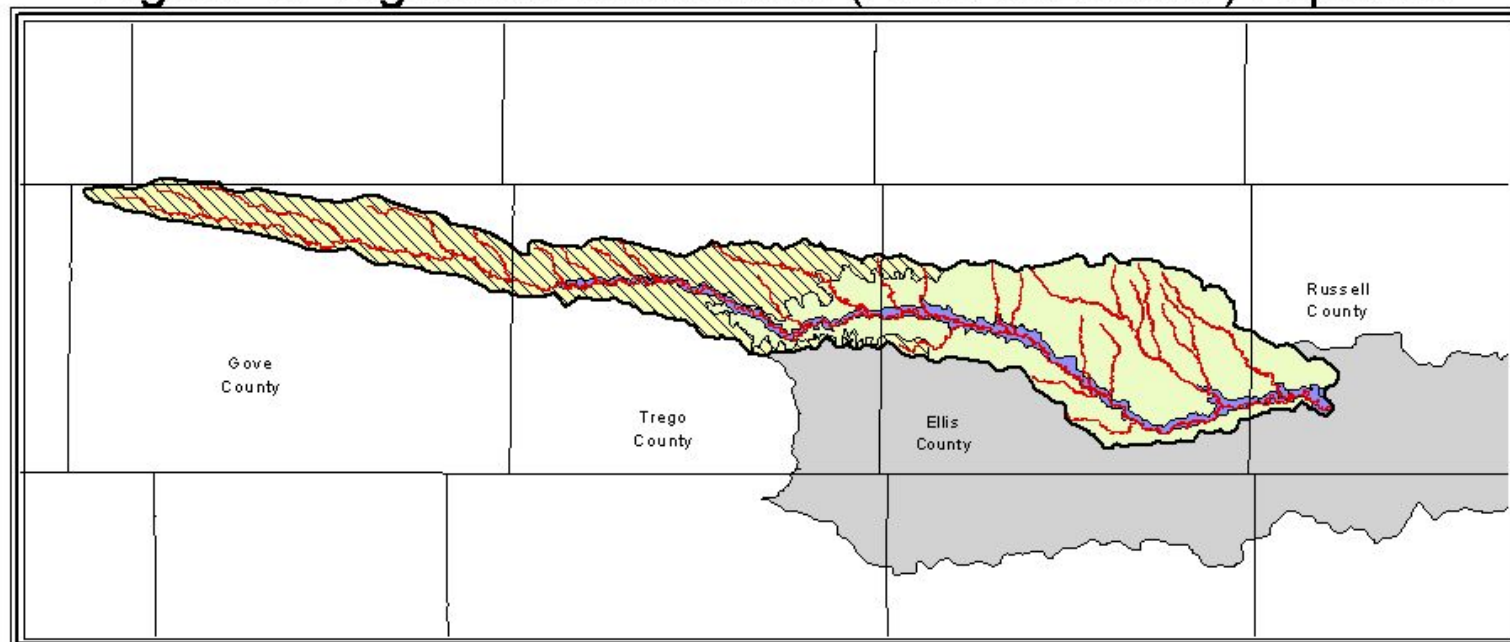


Source: Kansas Department of Health & Environment



Source: Kansas Department of Health & Environment

Figure 4. Big Creek Watershed (HUC 10260007) Aquifers



20 0 20 40 Miles

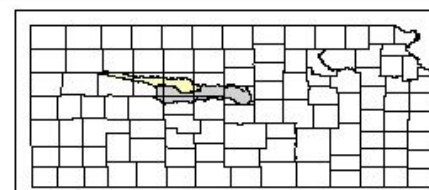


Figure 5. Big Creek Watershed (HUC 10260007) Land Cover

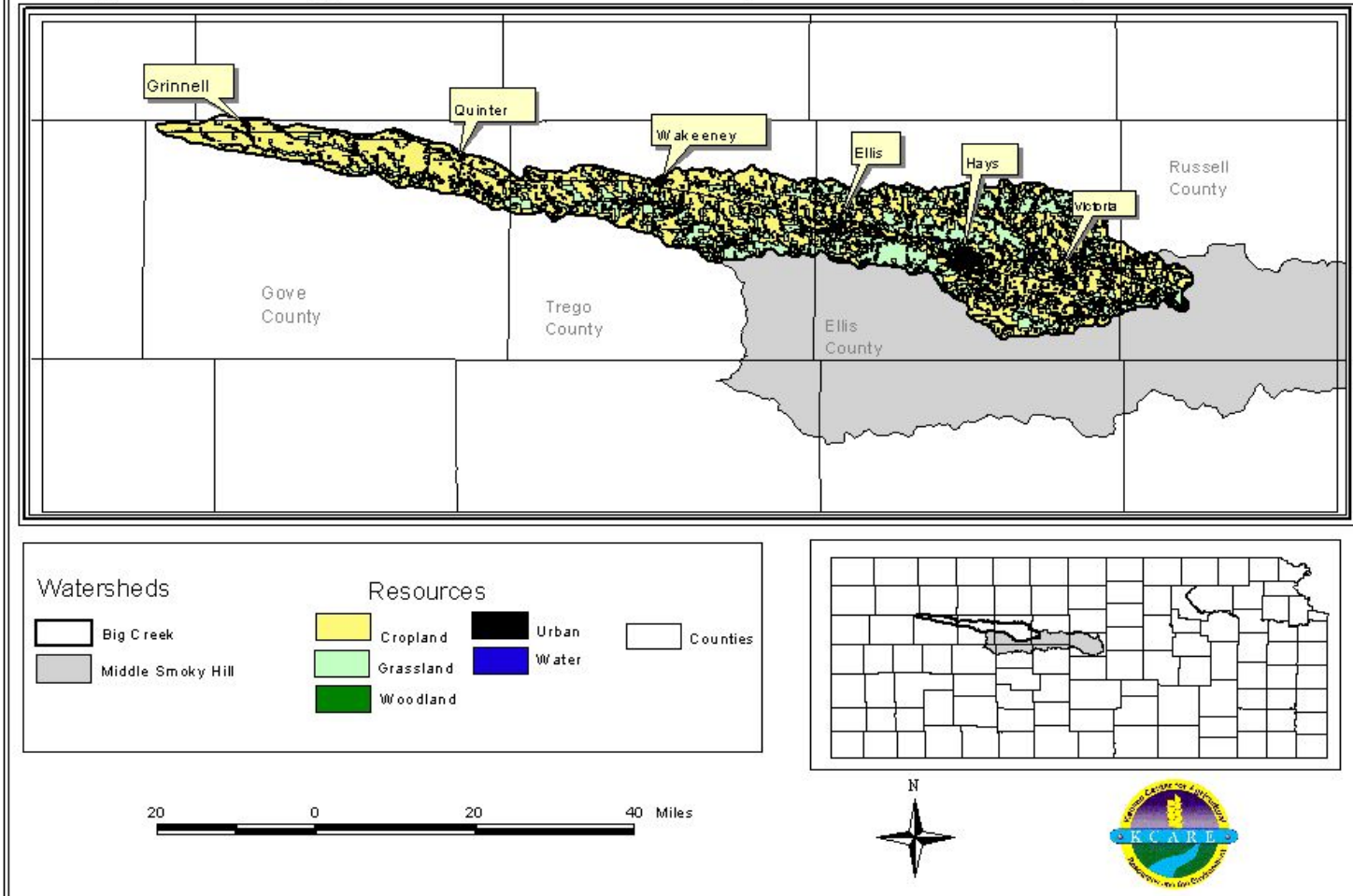


Table 1. County Farm Facts, 2002 (Farm Facts represent figures for the entire county not just the watershed)

Farm Facts	Gove	Trego	Ellis	Russell
Total Number of Farms	450	430	700	500
Land in Farms, acres	680,000	495,000	547,000	457,000
Wheat Harvested, acres	79,900	86,400	98,900	79,100
Sorghum Harvested, acres	81,700	35,100	31,600	31,500
Value of Field Crops, Dollars	22,459,100	18,981,500	16,584,100	20,846,300
Value of Livestock Production, Dollars	25,976,900	10,907,700	22,003,100	9,633,600

Source: Kansas Farm Facts

D. Overview of Water Quality

As part of the federal *Clean Water Action Plan*, the Big Creek watershed was classified as a “Category I – Watershed in Need of Restoration” by the 1999 *Unified Watershed Assessment* completed by KDHE and NRCS. It is ranked fifty-sixth out of ninety two watersheds in the state in need of restoration. According to the *Unified Watershed Assessment*, 82.5% of the total stream miles are impaired. Approximately 67% of the waterways and 50% of the lakes sampled require TMDLs (Figure 2 and Table 2). A TMDL (Total Maximum Daily Load) designation sets the maximum amount of pollutant that a specific body of water can receive without violating the surface water quality standards, and failing to support their designated uses. The TMDLs provide a tool to target and reduce point and nonpoint pollution sources. The goal of the WRAPS process is to address high priority TMDLs. Streams segments in this watershed are impaired by fecal coliform bacteria (FCB), chloride (Cl), sulfate (Sulf), ammonia (NH₃), selenium (Se) and dissolved oxygen (DO). Sulfate and ammonia do not currently have a TMDL. Selenium and dissolved oxygen have received a recommendation for approval of TMDL status from EPA as of July 19, 2004. Lakes are impaired by eutrophication (E) and insufficient water flow.

Table 2. TMDL Implementations

Water Body	Implementation Priority	E	FCB	Cl	Se	DO
Big Creek	Pending*		X			
Big Creek	Low				X	X
North Fork Big Creek	Low			X	X	
Big Creek Oxbow Lake	Low	X				
Ellis City Lake	Low	X				

Source: KDHE TMDL Reports

Key:

E=Eutrophication

FCB=Fecal Coliform Bacteria

Cl=Chloride

***Pending**=FCB have been classified as “Withheld/2219” at the current time. In 2003, the Kansas State Legislature passed House Bill 2219 that changed basic criteria for sampling data to determine TMDL status. In the new regulation, five samples are to be collected within one month from each sampling site. At this time, due to lack of manpower, this data is not available. Therefore, no new TMDL designations can be assigned until adequate sampling has been concluded.

Impacted waterways have been designated as a high, medium, or low priority TMDL. High priority TMDLs will receive state and federal assistance to improve water quality for the first five years after designation. Medium priority TMDLs will be reviewed and reevaluated after the sixth year to determine the status of the water quality. Low priority TMDLs will continue to have data collected and be reevaluated. Medium and low priority TMDLs may be upgraded as the need arises, or low priority TMDLs may be removed from the list.

Fecal coliform bacteria (FCB) is present in human and animal waste (including domestic and wildlife). Presence of FCB in waterways can originate from failing septic systems, runoff from livestock production areas, close proximity of animals to water sources, and manure application. TMDLs for fecal coliform bacteria have a limit of 200cfu(colony forming units)/100ml of water sample for primary contact recreation, such as swimming, and a limit of 2,000cfu/ml of water for secondary, non-contact recreation, such as boating and fishing.

Eutrophication (E) is a natural process creating conditions favorable for algae blooms and plant growth. Excess nutrient (nitrogen and phosphorus) loading from the watershed creates accelerated rates of eutrophication followed by decreasing amounts of dissolved oxygen (DO) in the water. This results in unfavorable habitat for aquatic life. Excess nutrients originate from manure and fertilizer runoff in rural and urban areas. Desirable criteria for healthy water includes dissolved oxygen rates greater than 5mg/L and biological oxygen demand (BOD) less than 3.5mg/L. Natural occurrences in the creeks of this watershed are periods of insufficient or no water flow. The lack of stream flow, an increase in water temperatures due to lack of riparian shading, and nutrient and organic enrichment are the primary causes for low dissolved oxygen.

Chloride (Cl) is a naturally occurring mineral found in Kansas lakes, streams, and groundwater. In high concentrations, chloride can cause deterioration of domestic plumbing, water heaters, and municipal water works. The TMDL for chloride is set at 250mg/L. Chloride intrusion results from parent bedrock material (halite) that underlies surface waters and leaches chloride into the water. Groundwater contamination is a result of natural leaching and improperly constructed water wells that allows confined aquifers to come into contact with each other.

Natural loading from underlying bedrock is the main cause of elevated selenium (Se) concentrations in groundwater. In addition, rainfall infiltrating through high selenium soils and weathered bedrock leaches selenium into streams. The endpoint goal for waters of the Big Creek watershed is .005mg/L selenium concentration, however, background concentrations must also be determined.

Groundwater sources are generally considered to be of good quality. Some pollutants may be of concern in the Alluvial Aquifer due to its shallow depth. These are nitrates, minerals, pesticides, and bacteria. The High Plains Aquifer contains water that is typically hard to very hard but in good condition with no dominating pollutants. The Dakota Aquifer contains water that is generally good, however, chloride and sodium content increase with depth.

Low permeability of the soils in the Big Creek watershed produces runoff under relatively low potential runoff

conditions. This runoff can carry soil particles with attached nutrients and FCBs, thereby creating “peak” periods of high concentrations of pollutants.

E. Priority Water Resources

A “priority water resource” is defined as those surface water resources with the following designated uses: domestic water supply (drinking water), primary contact recreation (swimming), special aquatic life (fish) support, and /or food procurement (fishing). Priority water resources include those resources in need of restoration and those in need of protection. Table 3 lists designated uses of stream segments in the watershed.

Table 3. Priority streams and lakes, drinking water supplies, and designated uses.

Water Source	Domestic Water Supply	Designated Uses
		Supports the indicated beneficial use
Big Creek	City of Russell	Ex, PCR, SCR, DWS, FP, GR, IW, IR, LW
Big Creek, North Fork	None	Ex, SCR, DWS, FP, GR, IWS, IR, LW
Chetolah Creek, Ogallah Creek, Walker Creek	None	Ex, SCR
Mud Creek	None	Ex
Big Creek Oxbow Lake, Ellis City Lake	None	Ex, PCR, FP

Source: Kansas Surface Water Registry

Key:

Ex=Expected aquatic life
PCR=Primary contact recreation
IW=Industrial water supply
IR=Irrigation use
LW=Livestock watering use

GR= Ground water recharge
SCR=Secondary contact recreation
DWS=Domestic water supply
FP=Food procurement

II. Water Quality Conditions and Resolutions Through Best Management Practices

A. Streams

Pollutants impact water quality in the streams and creeks of the Big Creek watershed. Sixty-seven percent of stream segments sampled need TMDLs. Approximately 55% of the streams are impaired by FCB, 17% by sulfate, 17% by chloride, and 11% by nitrates. Insufficient water flow during seasonal dry periods is a potential problem with the streams of this watershed. Low flow leads to stagnant pools that may have an increased temperature without proper riparian cover in the hotter parts of the year. An increase in temperature and stagnation may lead to algae blooms with corresponding low oxygen, thus creating an unfavorable environment for aquatic life.

Currently, Big Creek has a TMDL for Fecal Coliform Bacteria pending the required number of samples for TMDL determination. This sampling will be done in the near future. Excessive FCB are primarily caused by animal manure from fields, pastures, and small feedlots, in addition to human waste from failing wastewater systems. Incorporation of best management practices (BMPs) such as no-till and conservation tillage farming, manure incorporation, and removing cattle feeding and watering sites from streams are ways producers can help reduce FCB. Rural landowners can ensure their septic system is performing correctly in order to reduce human FCB from entering the streams and rivers. A decrease in the number of FCB will improve the streams/tributaries for primary contact recreational activities.

The North Fork of Big Creek has a TMDL set at 250mg/L for Chloride (Cl). Because Cl is a natural occurrence in Kansas lakes, streams and groundwater, the TMDL designation is set as a low priority. Dissolution of halite or rock salt is the primary cause of high Cl concentrations. Other contributions are excessive irrigation from the naturally saline groundwater of the Dakota Aquifer, and improperly constructed wells that allow groundwater from normally contained aquifers to come into contact. Past oil-brine disposal contribution is small in comparison with that from natural sources but it is significant. Disposal of saltwater from Russell County oil fields during the 1920's, 30's, and 40's into shallow wells has slowly been discharging to the Smoky Hill River. Oil-brine starts to enter the river system in Big Creek and continues in groundwater discharge downstream of the confluence with Big Creek and the Smoky Hill River. It will continue to bleed out for a substantial period of time.

Ammonia is also present in Big Creek, although there is no TMDL for ammonia at the present time. The most critical life stages of development (spawning, hatching, and early growth) of aquatic life are also the most sensitive periods of life to the presence of ammonia in the water. Potential sources of ammonia include livestock, septic systems, wildlife, and wastewater treatment facilities.

Sulfates do not have a TMDL at this time, although they are present in the stream. Sulfate is a naturally occurring mineral that can cause taste and odor problems in drinking water. Sulfates are dissolved into groundwater as the water moves through sulfur-containing rock formations.

In July 2004, additional impairments were submitted to EPA for approval as TMDLs in the Big Creek watershed. The North Fork of Big Creek received a priority 1 for selenium, while Big Creek at Munjor received a priority 2 for selenium. Big Creek at Hays received a number 2 priority for dissolved oxygen because of acute aquatic life impairment. This represents an occurrence of extreme oxygen depletion that could result in a fish kill, in contrast to chronic aquatic life impairment in which dissolved oxygen is persistently low. A number 1 priority is to be approved as a TMDL by 2007; while a number 2 or 3 priority will be approved by 2015.

B. Lakes

Approximately 50% of this watershed's lakes sampled need TMDLs. Primary pollutants for the lakes are eutrophication (E) and insufficient flows.

Eutrophication is a natural process which promotes algae blooms and plant growth; however, excessive nutrients such as phosphorus and nitrogen can accelerate this process. Prevention of these nutrients from entering the lakes is key in prohibiting eutrophication at greater rates than normal. Sources of excess nutrients include agricultural and urban fertilizer runoff, livestock and feedlot manure runoff, and failing septic systems. Accelerated algae and plant growth competes for dissolved oxygen and is detrimental to aquatic life. Big Creek Oxbow and Ellis City Lakes are both impaired by and have received a TMDL for eutrophication.

Insufficient water flow into both Big Creek Oxbow and Ellis City Lakes is a problem of concern. This can result in higher water temperatures, low dissolved oxygen and stagnation. Potential influences of insufficient flows include excessive irrigation withdrawals and drought.

Measures are needed to restore and protect the Big Creek watershed. Water resources with corresponding TMDLs and their TMDL goals are shown in Table 4. The watershed average for pollutants and the statewide average are shown in Appendix B.

Table 4. Priority Water Resources Requiring TMDLs

Water Resource	TMDL	Implementation Priority	Water Resources Average	TMDL Goals
Big Creek – Munjor Big Creek – Hays	FCB	Pending†	NA	<2,000cfu/ 100ml water
North Fork Big Creek	Cl	Low	245mg/L ^a	250mg/L
Big Creek Oxbow Lake	E	Low	Chlorophyll a 26.4mg/L	Chlorophyll a <12ug/L
Ellis City Lake	E	Low	Chlorophyll a 78.2mg/L	Chlorophyll a <12mg/L

Source: Kansas Nonpoint Source Pollution Management Plan and KDHE TMDL Report

Key:

†Pending=TMDL withheld pending adequate sampling data by KDHE

^a=Estimated average from KDHE TMDL Report

FCB=Fecal Coliform Bacteria

Cl=Chloride

E=Eutrophication

cfu=Colony forming units

BOD=Biological Oxygen Demand

III. Public Participation Contacts

Public participation is vital to address watershed restoration and protection. Private urban and rural landowners should be provided adequate educational information concerning pollutants, best management practices, and financial assistance. From September 2003 to October 2004, numerous events and activities have been conducted with a minimum of six thousand and forty-six contacts made with residents of the watershed (Table 5). A detailed list of public participation events, flyers, notes and newspaper articles are included in Appendix B.

Table 5. Public Participation Meetings

Event	Number of Participants
Tours and Demonstrations	194
Presentations	998
Displays	675
News Releases and Radio Interviews	Newsletter recipients: 1,800 Three Radio and TV Interviews: Coverage of entire watershed
Surveys	325
Children's Activities	1,037
Town Hall Conversations	89
Agency Discussion Groups	33
Festivals and Fairs	775
Clean Water Pledges	336
Total	6,262

Source: Stacie Minson, Watershed Specialist, KSRE

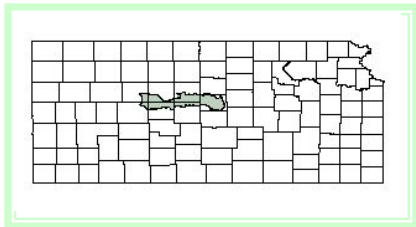
Section 3

Middle Smoky Hill Watershed

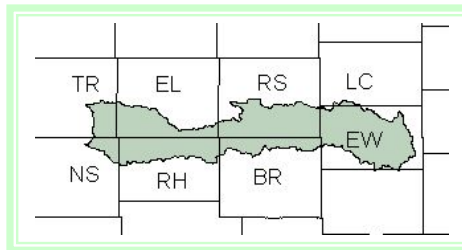
I. Watershed setting

A. Location

The Middle Smoky Hill Watershed covers portions of Trego, Ellis, Russell, Lincoln, Ness, Rush, Barton, and Ellsworth counties in western Kansas. It covers 1,562 square miles which includes 654 stream miles and 3,786 acres of lakes. The Middle Smoky Hill Watershed is the drainage waterway for the Smoky Hill River and its tributaries beginning at the dam below Cedar Bluff Reservoir in Trego County and traveling eastward to the dam below Kanopolis Lake in Ellsworth County. The major tributary contained in this watershed is Timber Creek in the western edge of the watershed.



Major cities in the watershed are Ellsworth (pop. 2,965) and Russell (pop. 4,696), and Hays (20,013) according to the 2000 Census Bureau. Approximately 83,509 people reside in the counties that contain the watershed with an average population density of 14.7 persons per square mile. The Kansas state average is 32.9 persons per square mile. Population has decreased in the counties of the watershed by 2.57 percent from 2000 to 2002 (US Census Bureau).



Counties:
BR=Barton
EL=Ellis
EW=Ellsworth
LC=Lincoln
NS=Ness
RH=Rush
RS=Russell
TR=Trego

B. Water Resources and Uses

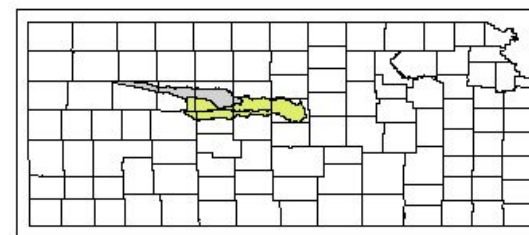
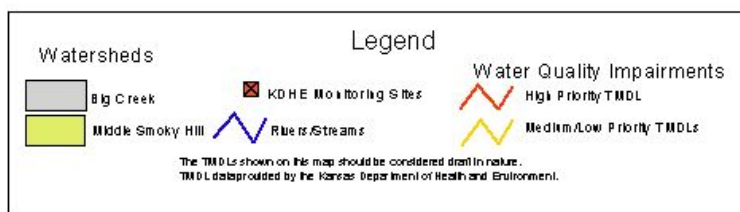
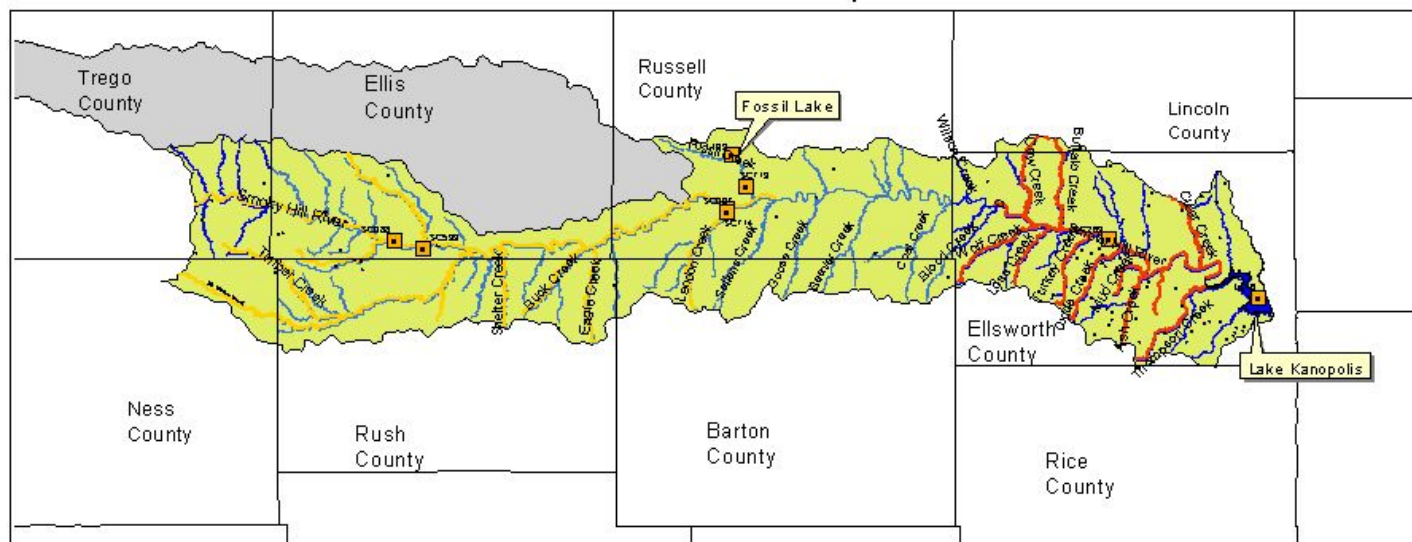


Numerous tributaries flow into the Smoky Hill River as it travels through the Middle Smoky Hill Watershed (Figure 6). The main tributary is Timber Creek; however, Big Creek (discussed in Section 2 of this report) empties into the Smoky Hill in Russell County. The waters of the Smoky Hill River feed into Kanopolis Reservoir, a lake covering 3,742 surface acres. Storage in Kanopolis Reservoir began in 1948 as a multi-purpose project allocated for domestic, industrial and livestock water supply, flood control, water quality and recreation purposes. A smaller lake, Fossil Lake, is located on Fossil Creek near Russell. It covers 44 acres and is important for swimming, boating, fishing and domestic and industrial water supply. These are commonly referred to as “designated uses”. Annual rainfall averages range from 20-29 inches with a 24 hour, 25 year annual rainfall event of 5.1 inches.

Wastewater treatment facilities are permitted and regulated through KDHE (Kansas Department of Health and Environment). These National Pollutant Discharge Elimination System (NPDES) permits specify the maximum amount of pollutants allowed to be discharged into surface waters. The municipal and industrial wastewater treatment facilities along the Smoky Hill River and its tributaries are marked in Figure 7. Thousands of privately owned septic systems exist in the watershed.

Major groundwater aquifers that underlie the watershed are the Dakota Aquifer, the Alluvial Aquifers from the river, and small portions of the High Plains Aquifer (see Figure 8). There are 821 known groundwater wells located in the watershed in addition to an estimated 2,500 wells within the City of Hays. Water from these wells is used for domestic use, monitoring, lawn, garden, and irrigation supplies.

Figure 6. Middle Smoky Hill River Watershed (HUC 10260006)
Water Resources and Impairments



20 0 20 40 Miles



Figure 7. Middle Smoky Hill River Watershed (HUC 10260006)
Water Resources and Point Source Pollution

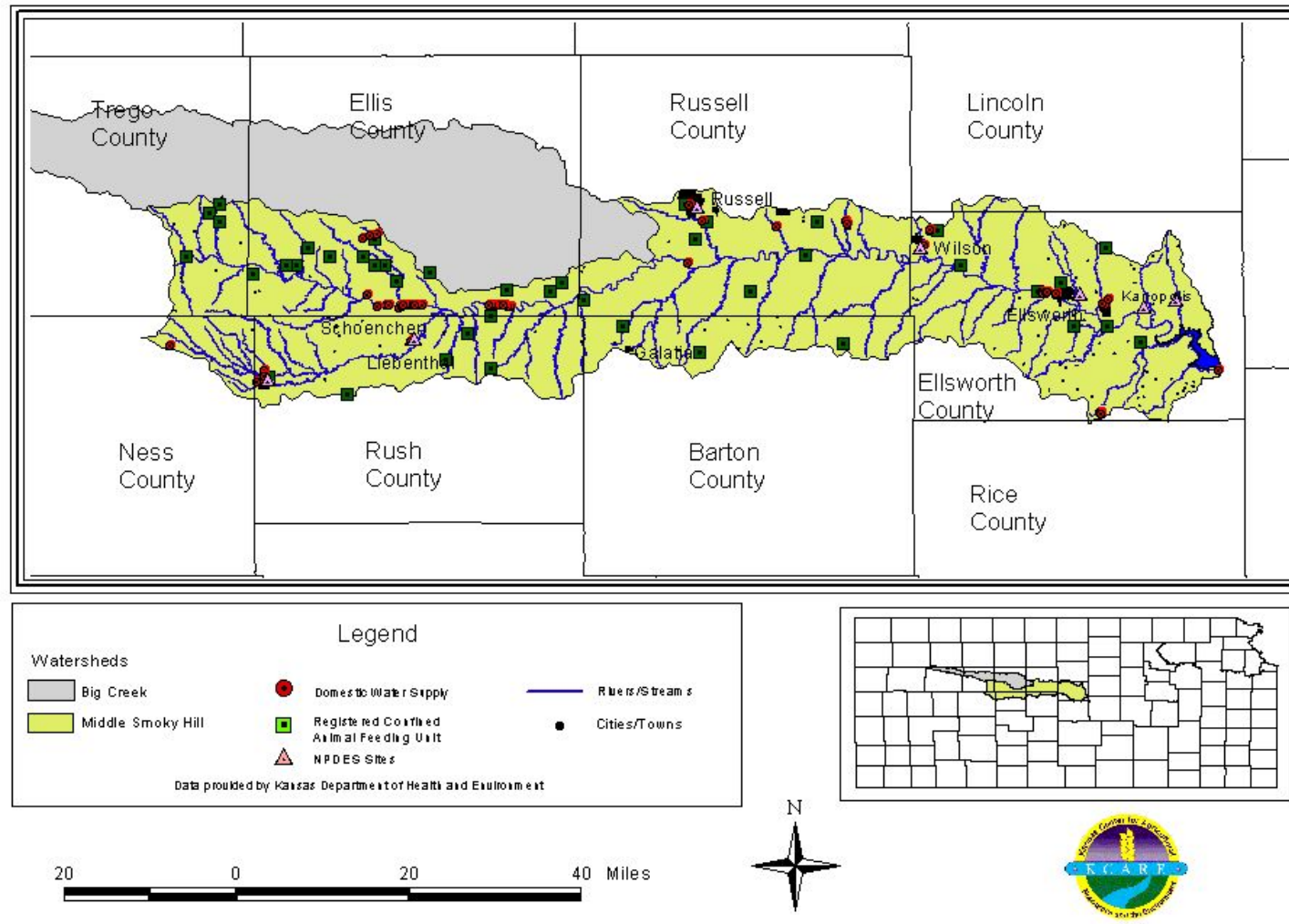
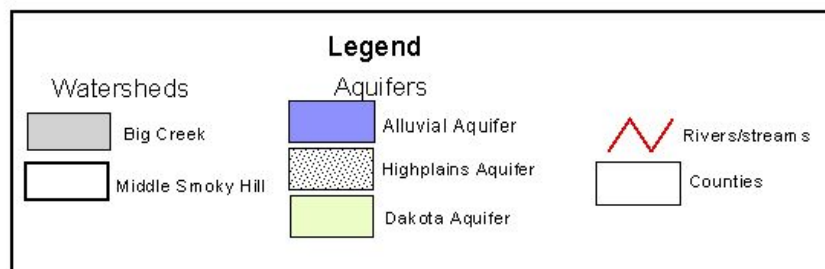
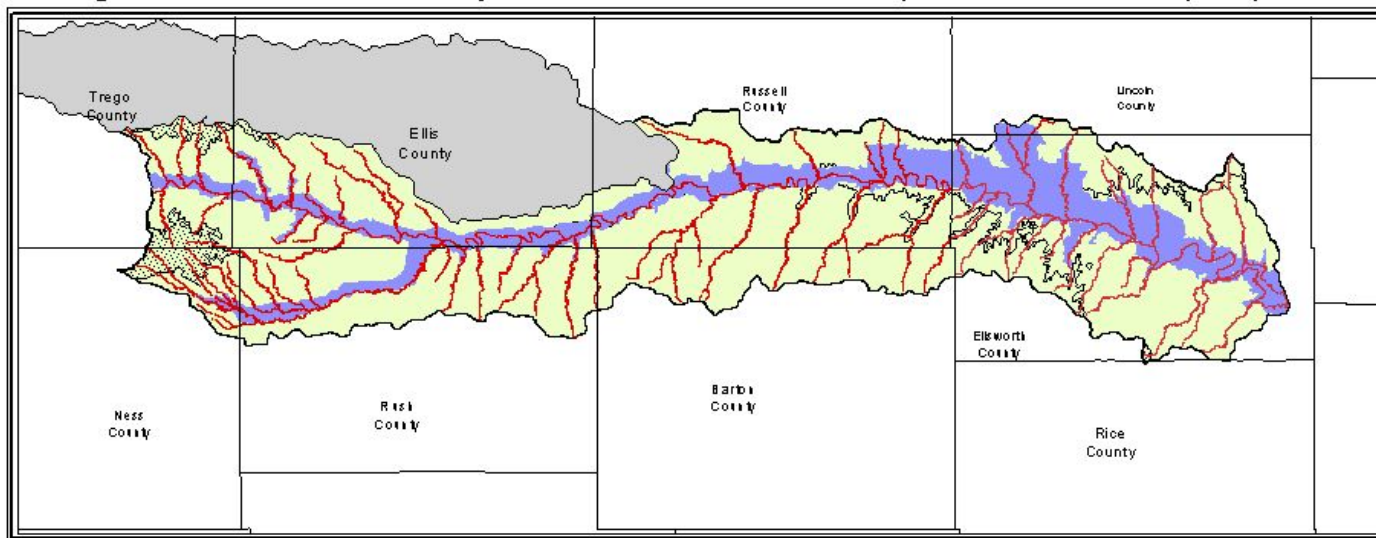
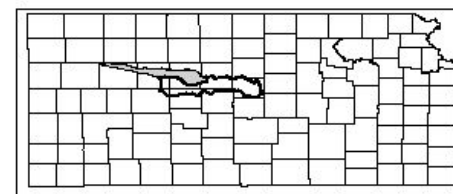


Figure 8. Middle Smoky Hill River Watershed (HUC 10260006) Aquifers

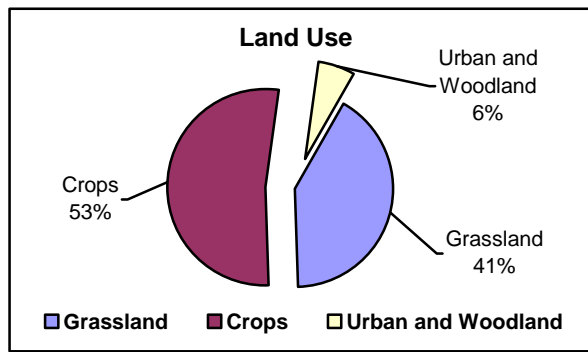


20 0 20 40 Miles

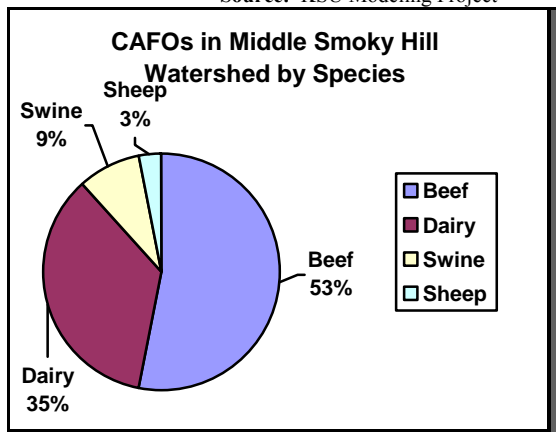


C. Land Use

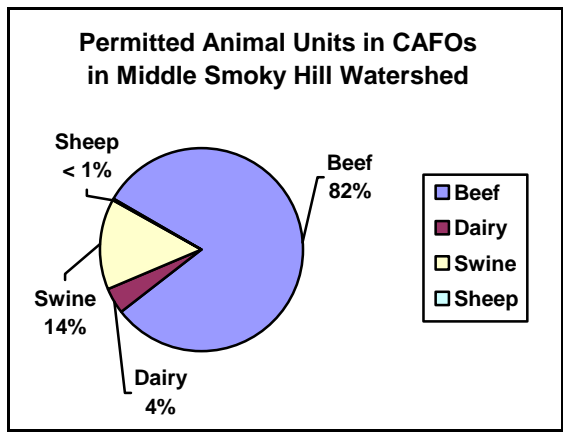
Land use activities can have a significant impact on the types and quantity of nonpoint source pollutants in the watershed. The primary land uses in the watershed land area are grasslands (41%), crop production (53%), with urban areas and woodlands occupying the remaining 6% of the watershed (Figure 9). The main crops grown are wheat, corn, grain sorghum and soybeans. At the current time, approximately thirty-four (18 beef, 12 dairy, 3 swine, 1 sheep) Confined Animal Feeding Operations (CAFOs) that are permitted in the watershed which are allowed to contain 23,985 animal units or AU (equal standards for all animals based on size and manure production; 1 AU = 700 pounds). See Figure 7.



Source: KSU Modeling Project



Source: Kansas Department of Health and Environment



Source: Kansas Department of Health and Environment

Figure 9. Middle Smoky Hill River Watershed (HUC 10260006) Land Cover

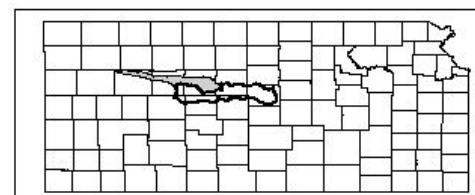
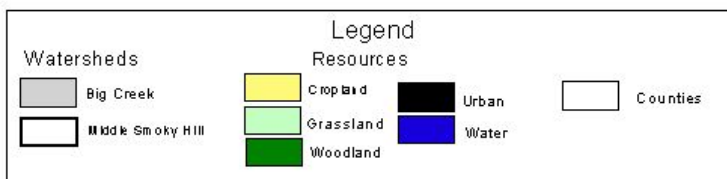
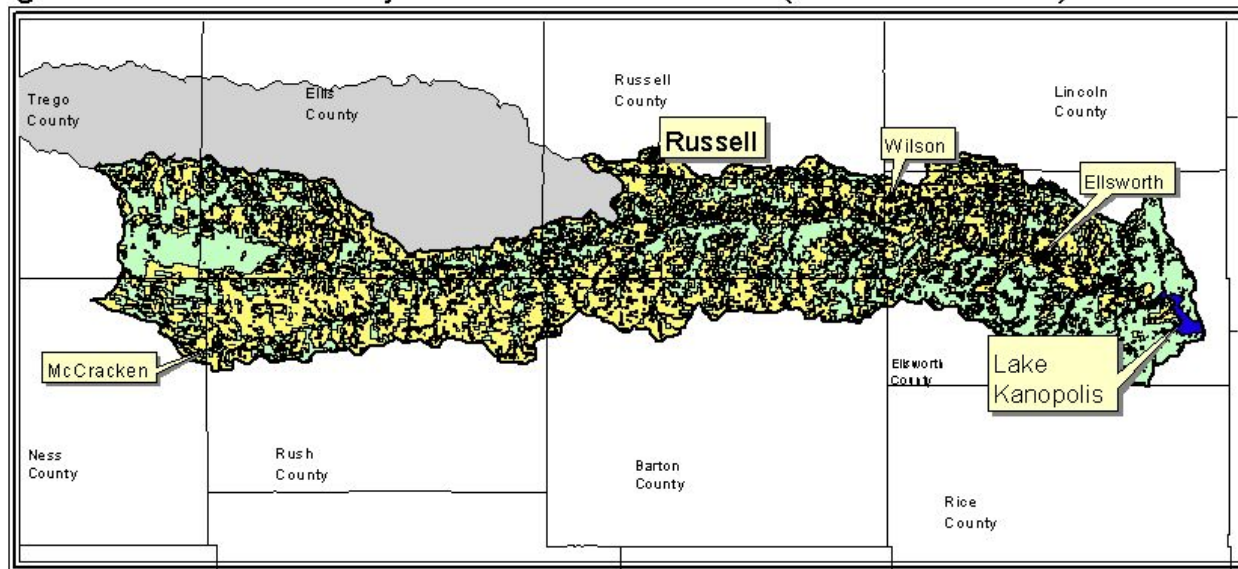


Table 6. County Farm Facts, 2002 (Farm Facts represent figures for the entire county not just the watershed)

Farm Facts	Barton	Trego	Ellis	Ellsworth	Lincoln	Ness	Rush	Russell
Total Number of Farms	770	430	700	430	480	540	500	500
Land in Farms, acres	598,000	495,000	547,000	428,000	475,000	685,000	425,000	457,000
Wheat Harvested, acres	152,700	86,400	98,900	91,800	98,600	150,100	119,300	79,100
Corn Harvested, acres	26,700	7,400	1,200	1,100	200	1,200	3,200	800
Sorghum Harvested, acres	55,600	35,100	31,600	30,200	38,700	41,000	45,200	31,500
Soybeans Harvested, acres	16,200	1,700	1,300	2,100	8,000	1,900	4,800	3,200
Value of Field Crops, Millions of Dollars	54.949	18.981	16.584	19.308	25.603	19.085	20.966	20.846
Value of Livestock Production, Millions of Dollars	43.041	10.907	22.003	8.993	13.143	10.363	5.877	9.633

Source: Kansas Farm Facts

D. Overview of Water Quality

The Middle Smoky Hill watershed has been classified as a “Category I – Watershed in Need of Restoration” by the 1999 *Unified Watershed Assessment*, completed by KDHE and NRCS. The watershed received this classification due to degradation of aquatic systems including habitat, ecosystem health and living resources. Watershed restoration ranking is fifty-first out of ninety two watersheds in the state. According to the *Unified Watershed Assessment*, 15.4% of the total stream miles are impaired. Approximately 20% of the waterways and 40% of the lakes sampled require TMDLs (Figure 9 and Table 7). A TMDL (Total Maximum Daily Load) designation sets the maximum amount of pollutant that a specific body of water can receive without violating the surface water quality standards, and failing to support their designated uses. The TMDLs provide a tool to target and reduce point and nonpoint pollution sources. Stream segments in this watershed are impaired by fecal coliform bacteria (FCB), sulfate (Sulf), and chloride (Cl). Lakes are impaired by eutrophication (E), and sulfate (Sulf).

Table 7. TMDL Implementations

Water Body	Implementation Priority	E	Silt	FCB	Cl	Sulf
Smoky Hill River – Russell and Ellsworth	Low				X	X
Smoky Hill River - Russell	Pending†			X		
Smoky Hill River - Schoenchen	Low					X
Smoky Hill River - Wilson	Low				X	
Fossil Creek	Low				X	
Landon Creek	Low				X	
Beaver Creek	Low				X	
Goose Creek	Low				X	
Sellens Creek	Low				X	
Fossil Lake	Low	X	X			
Kanopolis Lake	High	X				
Kanopolis Lake	Low				X	X

Source: KDHE TMDL Report

Key:

E=Eutrophication

FCB=Fecal Coliform Bacteria

Cl=Chloride

†Pending=TMDL withheld pending EPA approval of regulation placing House Bill 2219 in *Water Quality Standards*

Impacted waterways have been designated as a high, medium, or low priority TMDL. High priority TMDLs will receive state and federal assistance to improve water quality for the first five years after designation. Medium priority TMDLs will be reviewed and reevaluated after the sixth year to determine the status of the water quality. Low priority TMDLs will continue to have data collected and be reevaluated. Medium and low priority TMDLs may be upgraded as the need arises, or low priority TMDLs may be removed from the list.

†**Pending**=FCB have been classified as “Withheld/2219” at the current time. In 2003, the Kansas State Legislature passed House Bill 2219 that changed basic criteria for sampling data to determine TMDL status. In the new regulation, five samples are to be collected within one month from each sampling site. At this time, due to lack of manpower, this data is not available. Therefore, no new TMDL designations can be assigned until adequate sampling has been concluded.

Fecal coliform bacteria (FCB) is present in human and animal waste (including domestic and wildlife). Presence of FCB in waterways can originate from failing septic systems, runoff from livestock production areas, close proximity of animals to water sources, and manure application. TMDLs for fecal coliform bacteria have a maximum limit of 200cfu(colony forming units)/100ml of water sample for primary contact recreation, such as swimming, and a maximum limit of 2,000cfu/ml of water for secondary, non-contact recreation, such as boating and fishing.

Eutrophication (E) is a natural process which creates conditions favorable for algae blooms and plant growth. Excess nutrient (nitrogen and phosphorus) loading from the watershed creates accelerated rates of eutrophication followed by decreasing amounts of dissolved oxygen (DO) in the water. This results in an unfavorable habitat for aquatic life. Sources of excess nutrients include rural and urban fertilizer runoff, livestock and feedlot manure runoff, and failing septic systems. Desirable criteria for healthy water includes dissolved oxygen rates greater than 5mg/L and biological oxygen demand (BOD) less than 3.5mg/L.

Chloride (Cl) is a naturally occurring inorganic mineral found in Kansas lakes, streams, and groundwater. The TMDL goal for chloride is 250mg/L for drinking water consumption. In high concentrations, chloride can cause adverse taste, hypertension in humans, and deterioration of domestic plumbing and municipal water works. Chloride intrusion results from parent bedrock material (halite) that underlies surface waters and leaches chloride into the water. Groundwater contamination is a result of natural leaching and improperly constructed water wells allowing confined aquifers to come into contact with each other.

Sulfate is another naturally occurring mineral that is found dissolved in Kansas waters. It causes taste and odor problems in drinking water. Sources of sulfate are similar to those of chloride: natural leaching from parent bedrock material (gypsum and pyrite) and irrigation discharge from the Dakota Aquifer. Variations of water flow can cause fluctuations in sulfate concentrations since runoff from a substantial rainstorm will dilute the sulfate concentration. Conversely, evaporation of surface waters and low water flow increases the sulfate concentration in the water.

Siltation or sediment accumulation in lakes reduces the lake volume, limits accessibility to certain portions of the lake, inhibits aquatic life and increases turbidity. Soil erosion is the primary cause of sediment in streams. Phosphorus can be attached to sediment particles that enter the lake, therefore by reducing sediment, eutrophication can also be reduced.

Groundwater sources (the Dakota Aquifer and the Alluvial Aquifer) are generally considered to be of good quality. Some pollutants may be of concern in the Alluvial Aquifer due to its shallow depth. These are nitrates, minerals, pesticides, and bacteria. This aquifer is the primary source for public water supplies. The Dakota Aquifer contains water that is generally good; however, chloride and sodium content increase with depth. The Dakota Aquifer is primarily used for irrigation.

E. Priority Water Resources

A “priority water resource” is defined as those surface water resources with the following designated uses: domestic water supply (drinking water), primary contact recreation (swimming), special aquatic life (fish) support, and /or food procurement (fishing). Priority water resources include those resources in need of restoration and those in need of protection (see Table 8).

Table 8. Priority streams and lakes, domestic water supplies, and designated uses

Water Source	Domestic Water Supply	Designated Uses
		Supports the indicated beneficial use
Ash Creek Clear Creek Skunk Creek Thompson Creek	None	Ex, DWS
Beaver Creek	None	Ex, PCR, FP
Big Timber Creek Buck Creek Coal Creek Cow Creek Eagle Creek Goose Creek Loss Creek Mud Creek Oxide Creek Shelter Creek Spring Creek Timber Creek Turkey Creek Unnamed Stream Wilson Creek Wolf Creek	None	Ex
Blood Creek Buffalo Creek Landon Creek Sellens Creek	None	Ex, FP
Fossil Creek	None	Ex, SCR, DWS, FP, GR, IWS, IR, LW
Smoky Hill River	City of Russell	Ex, S, PCR, DWS, FP, GR, IWS, IR, LW
Fossil Lake	None	Ex, PCR, DWS, FP, IW
Kanopolis Lake	Post Rock Rural Water District serves cities: Ellsworth, Dorrance, Gorham, and Wilson Lake Estates development	Ex, PCR, DWS, FP, IW

Source: Kansas Surface Water Registry

Key:

Ex=Expected aquatic life
S=Special Aquatic Life
PCR=Primary contact recreation
DWS=Domestic water supply
FP=Food procurement

GR= Ground water recharge
IW=Industrial water supply
IR=Irrigation use
LW=Livestock watering use

II. Water Quality Conditions and Resolutions Through Best Management Practices

A. Streams

Pollutants impact water quality in twenty percent of the streams and creeks of the Middle Smoky Hill watershed. Approximately 48% of the streams are impaired by FCB, 26% are impaired by sulfate, and 26% are impaired by chloride.

The Smoky Hill River near Russell has a TMDL for Fecal Coliform Bacteria that is currently being withheld pending additional sampling needed to meet regulations. Incorporation of best management practices (BMPs) such as no-till and conservation tillage farming, manure incorporation, and removing cattle feeding and watering sites from streams are ways producers can help reduce FCB. Rural landowners can ensure their septic system is performing correctly in order to reduce human FCB from entering the streams and rivers. A decrease in the number of FCB will improve the river for primary contact recreational activities such as swimming.



Above ground septic system demonstration

Segments of the Smoky Hill River at Russell and Ellsworth, and Landon Creek have a low priority TMDL for chloride. The TMDL for chloride is set at 250mg/L for drinking water. Chloride is a naturally occurring inorganic mineral found in Kansas lakes, streams and groundwater. Irrigation from the Dakota Aquifer can increase chloride content in the river. Excessive rainfall events will dilute the chloride concentration, while chloride concentrations may increase from low flow of river water and excessive irrigation.

The Smoky Hill River at Russell, Ellsworth, and Schoenchen has a low priority TMDL for sulfates. Sulfate concentration becomes more dilute in the river as it nears Lake Kanopolis. Near Cedar Bluff Dam, at Schoenchen, sulfate averages 397mg/L, at Russell the average is 287mg/L, the monitoring station at Wilson averages 260mg/L, and at Ellsworth the average is 220mg/L. The ultimate goal for this TMDL will be to achieve Kansas Water Quality Standards of 250mg/L for drinking water. However, due to natural sources of sulfate that are uncontrollable, an alternate endpoint is needed. The tentative endpoint for Schoenchen is 464mg/L and 411mg/L for Russell. Seasonal variances are built into this TMDL accounting for the association of water flow and sulfate concentration.

In July 2004, additional impairments were submitted to EPA for approval as TMDLs in the Middle Smoky Hill watershed. Fossil Creek, Landon Creek and the Smoky Hill River at Schoenchen have received impairments for selenium with priorities of 1, 2, and 3 respectively. A number 1 priority is to be approved as a TMDL by 2007; while a number 2 or 3 priority will be approved by 2015. The Smoky Hill River at Ellsworth has received a number 3 priority for biological impairment.

B. Lakes

Approximately forty percent of the watershed's lakes need TMDLs. Fifty percent of the impaired lakes are eutrophic and fifty percent are impaired by sulfate.

Fossil Lake has received a low priority TMDL and Kanopolis Lake has received a high priority TMDL for eutrophication. Prevention of excess nutrients from entering the lakes is key in prohibiting eutrophication at greater rates than normal. Best management practices such as establishing buffer strips, incorporating manure, and applying recommended rates of fertilizer on farms and residential lawns are needed to reduce eutrophication in the lakes.

Fossil Lake has a low priority TMDL for siltation. The lake has turbidity of 81.3 FTU (Formazin Turbidity Unit),

which is caused by a steady infiltration of silt. A reduction of 54% is needed to maximize clarity in the lake. Secchi Disc Depth (measure of transparency) is 0.15 meters. In order to improve the water quality, a Secchi Disc Depth of 0.88 meters is the desired goal. This would encourage and support aquatic life within the lake. Prevention of soil erosion will reduce siltation in the lake. Establishing best management practices such as fencing cattle out of streams, not overgrazing pastures, planting buffer strips, and no-till farming can help to prevent erosion.

Kanopolis Lake has a TMDL for chloride. The primary source of chloride in Kanopolis Lake is the discharge of naturally saline groundwater from the Dakota Aquifer into the Alluvial Aquifer of the Smoky Hill River and then into the river in Russell County. The saline groundwater originates from the upward intrusion of saltwater (average 26,000mg/L Cl) from the sandstone which underlies the Dakota aquifer. Oil brine also contributes to chloride in Russell County. Chloride from an oil-brine source contributes as much as 10-20% of the total chloride content in the lake water depending on river flow. This contribution of chloride will continue for a substantial amount of time.

Sulfate has received a low priority TMDL for Lake Kanopolis because natural sulfate loading within the watershed is overwhelmingly responsible for the excursions seen. Variations in seasonal sulfate concentration depend on which part of the watershed receives more rainfall and thus contributes greater inflow to the lake. In 1994, Kanopolis Lake was listed as impaired due to an exceedance above 250mg/L (exceedance equaled 288mg/L). Since that time, the water quality has significantly improved averaging 184mg/L.

Measures are needed to restore and protect the Middle Smoky Hill watershed. Water resources with corresponding TMDLs and their TMDL goals are shown in Table 9. The watershed average for pollutants and the statewide average are shown in Appendix B.

Table 9. Priority Water Resources Requiring TMDLs

Water Resource	TMDL	Implementation Priority	Water Resource Averages	TMDL Goals
Smoky Hill - Russell	FCB	Pending†	NA	<2,000cfu/100ml water
Smoky Hill – Russell	Sulf	Low	287mg/L	250mg/L
Smoky Hill – Ellsworth			220mg/L	
Smoky Hill – Schoenchen			397mg/L	
Smoky Hill – Wilson			260mg/L	
Landon Creek			*	
Coal Creek			*	
Beaver Creek			*	
Goose Creek			*	
Sellens Creek			*	

Smoky Hill – Russell Smoky Hill – Ellsworth Fossil Creek Landon Creek Smoky Hill – Wilson Beaver Creek Goose Creek Sellens Creek	Cl	Low	601mg/L 365mg/L * * 414mg/L * * *	250mg/L
Fossil Lake	E	Low	Chlorophyll a 5.4mg/L Secchi Disc Depth 15cm	Chlorophyll a ≤5.4ug/L Secchi Disc Depth 88cm
Fossil Lake	Silt	Low	Turbidity 81.3FTU Secchi Disc Depth 15cm	Turbidity 37.8FTU Secchi Disc Depth 88cm
Kanopolis Lake	E	High	Chlorophyll a 24.2ug/L Nitrogen 1.19mg/L	Chlorophyll a <12ug/L Nitrogen <0.62mg/L
Kanopolis Lake	Sulf	Low	191mg/L ¹	250mg/L
Kanopolis Lake	Cl	Low	231mg/L ²	250mg/L

Source: Kansas Nonpoint Source Pollution Management Plan and KDHE TMDL Report

Key:

†Pending=TMDL withheld pending EPA approval of regulation placing House Bill 2219 in Water Quality Standards

*=Tributary stations had median flows below 1cfs, therefore were not subject to numeric criteria.

¹=The exceedance above the domestic water quality standard that caused the lake to be listed on the 1998 303(d) list occurred in 1994 (288mg/L). Since 1994, the average Sulf concentration has been 184mg/L.

²=Exceedances above domestic water quality standard occurred in 1988 (357mg/L) and 1994 (277mg/L). Since 1994, the average Cl concentration has been 191mg/L.

NA=Not Available

FCB=Fecal Coliform Bacteria

Cl=Chloride

E=Eutrophication

cfu=Colony forming units

BOD=Biological Oxygen Demand

FTU=Formazin Turbidity Units

mg/L=milligrams per liter or parts per million

ug/L=micrograms per liter or parts per billion

III. Public Participation Contacts

Public participation is vital to watershed restoration and protection. Private urban and rural landowners should be provided adequate educational information concerning pollutants, best management practices, and financial assistance. From September 2003 to October 2004, numerous events and activities have been conducted with a minimum of seven thousand, six hundred twenty-two contacts made with residents in the watershed. (Table 10). A full list of public events in addition to flyers, notes and newspaper articles is included in Appendix B.

Table 10. Public Participation Contacts

Event	Total Number of Participants
Tours and Demonstrations	273
Presentations	1,028
Displays	675
News Releases and Radio Interviews	Newsletter recipients: 3,000 Three Radio and TV Interviews: Coverage of entire watershed
Surveys	325
Children's Activities	1,121
Town Hall Conversations	136
Agency Discussion Groups	33
Festivals and Fairs	775
Clean Water Pledges	410
Total	7,776

Source: Stacie Minson, Watershed Specialist,

Section 4

Water Quality Goals, Implementations and Actions in Support of Implementations Big Creek and Middle Smoky Hill River Watersheds

Local stakeholders in the Big Creek and Middle Smoky Hill watersheds have identified specific goals needed in order to achieve water quality improvement. Implementation of best management practices, as well as monetary incentives and cost share programs will, over time, lead to decreases in fecal coliform bacteria, nutrient enrichment, and eutrophication in the waters of the Big Creek watershed. As a result, aquatic life will be enhanced due to an increase in dissolved oxygen. Responsibility of restoration and protection of the watershed will primarily rest in the hands of private citizens or stakeholders. For this reason, federal and state agencies provide funding for education activities and implementation of best management practices. Computer modeling data for the reduction of phosphorus have been generated for the Kanopolis Watershed. A table of this data is listed in Section 5, Appendices, page 53. Table 11 lists specific goals that have been identified as concerns by the public in need of actions to improve water quality and estimated associated costs by cooperating agencies. These goals are not listed in any particular order.

Table 11. Implementations aimed at specific water quality goals.

Goal 1a: Reduce cropland and streambank erosion to reach water quality goals of DO> 5mg/L, BOD< 3.5mg/L, TDS< 808mg/L, and TSS< 101mg/L in rivers and lakes						
<ul style="list-style-type: none"> ▪ 786,111 acres cropland in Big Creek and Middle Smoky Hill watersheds that can use additional BMPs ▪ 975 stream miles in Big Creek and Middle Smoky Hill watersheds that can use additional erosion protection 						
Implementation of BMPs	Actions in support of BMP implementation	Time frame	Estimated costs	Implementation Targets	Percent P, N, and TSS Reduction in Runoff ^a	Cooperating Agencies
1a.1 Establish vegetative buffer strips for general erosion control.	Cost share programs	2005-2015	\$6,288,880.00 (\$80.00 per acre ^b)	Target: Increase use of BMPs by 78,611 acres/year	50% P 35% N 50% TSS	CD, KDHE, NRCS, KSRE, SCC
1a.2 Move seasonal and/or concentrated feeding and watering sites away from streams.	Cost share programs	2005-2015	\$48,000.00 (Average cost per site= \$4,000.00 ^b)	Target: 55 contacts per year resulting in 12 contracts per year	NA	CD, KDHE, NRCS, KSRE, SCC
1a.3 Relocating confined feeding facilities including seasonal sites	Cost share programs	2005-2015	\$372,000.00 (Cost per site=\$12,000 to \$50,000 depending on size of facility to be moved ^b)	Target: 55 contacts per year resulting in 12 contracts per year	NA	CD, KDHE, NRCS, KSRE, SCC

1a.4 Build terraces and install grass waterways.	Cost share programs	2005-2015		Target: 80 acres per year	30% P 30% N 30% TSS	KDHE, CD, NRCS, SCC, KSRE
1a.5 Rebuild terraces	Cost share programs	2005-2015	\$312,000.00 (\$.65 per linear ft. ^b)	Target: 480,000 linear ft./year	30% P 30% N 30% TSS	KDHE, CD, NRCS, SCC, KSRE
1a.6 Farming on the contour and utilize no-till or minimum tillage practices.	Cost share programs	2005-2015	\$943,332.00 (\$12.00 per acre ^b)	Target: Increase use of BMPs by 78,611 acres/year	40% P 25% N 75% TSS	CD, KDHE, NRCS, KSRE, SCC
1a.7 Educate farmers and landowners on the benefits of conservation for erosion protection.	Educational tours, demonstrations, one-on-one meetings with Watershed Specialist, and whole farm plans.	2005-2015	\$124,444.00 (\$2.00 per person living in watershed)			KSRE, KDHE, NRCS, CD

Goal 1b: Reduce erosion from land enrolled in CRP (Conservation Reserve Program) and maintain acres enrolled in CRP to reach water quality goals of DO > 5mg/L, BOD< 3.5mg/L, TDS< 808mg/L, and TSS< 101mg/L in rivers and lakes

- Estimated 94,600 acres of CRP in Big Creek and Middle Smoky Hill watersheds that can use additional BMPs

Implementation of BMPs	Actions in support of BMP implementation	Time frame	Estimated costs	Implementation Targets	Cooperating Agencies
1b.1 Educational efforts to enroll eligible acres in CRP	Cost share programs	2005-2015	\$47,300.00 (\$5.00 per acre ^b)	Target: Enroll 9,460 additional acres (10% of existing acres) into CRP per year to decrease erosion and improve water quality	NRCS, CD, KSRE, SCC
1b.2 Educational efforts to maintain current acres in CRP	Cost share programs	2005-2015	\$4,000.00 (\$5.00 per acre ^b)	Target: Continue with use of BMPs on 800 acres per year that could potentially come out of CRP program (returning CRP land to cropland production would cost the farmer \$120.00 per acre ^b).	NRCS, CD, KSRE, SCC

Goal 2: Reduce fecal coliform bacteria (originating from livestock) to reach water quality goals of $\leq 200\text{cfu}/100\text{ml}$ for swimming, and $\leq 2,000\text{cfu}/100\text{ml}$ for boating and fishing in rivers and lakes

- 677,055 acres grassland in Big Creek and Middle Smoky Hill watersheds that can use additional BMPs
- 975 stream miles in Big Creek and Middle Smoky Hill watersheds that can use additional BMPs

Implementation of BMPs	Actions in support of BMP implementation	Time frame	Estimated costs	Implementation Targets	Cooperating Agencies
2.1 Implement management practices intended to minimize time livestock spend in or around water source	Cost share programs	2005-2015	\$1,229,184.00 (\$1.20/ft. for 97 stream miles ^b)	Target: Improve riparian area along 97 miles of streams, ponds, lakes, and water bodies per year	CD, KDHE, NRCS, KSRE, SCC
2.2 Establish buffer strips (grass and/or trees) along streams	Cost share programs	2005-2015	\$5,000.00 (\$100.00/acre ^a)	Target: Contact with land owners of 200 acres (5.52 stream miles) per year resulting in contracts on 50 acres (1.38 stream miles per year)	CD, KDHE, NRCS, KSRE, SCC
2.3 Relocate water sources away from streams/ponds	Cost share programs	2005-2015	\$30,000.00 (\$3,000.00 per alternative powered water system ^b)	Target: Contact 45 land owners per year resulting in contracts for 10 projects per year	CD, KDHE, NRCS, KSRE, SCC
2.4 Livestock waste utilization/nutrient management	Cost share programs, EQIP	2005-2015	\$186,400.00 (\$8.00/acre ^b)	Target: Apply manure management to 10% of grassland containing cattle per year	CD, KDHE, NRCS, KSRE, SCC
2.5 Educate farmers and landowners on methods of reducing runoff	Tours of collection ponds and BMPs, demonstrations of economic benefits, development of whole farm plans and one-on-one meetings with Watershed Specialist	2005-2015	\$124,444.00 (\$2.00 per person living in watershed)		CD, KDHE, NRCS, KSRE, SCC
2.6 Educate homeowners on the importance of maintaining properly functioning septic systems and replacing failing/illegal systems	Cost share programs	2005-2015	\$72,000-\$144,000.00 (\$1,200-\$1,500/system of cost share money, with total system cost ranging from \$3,000-\$6,000)	Target: Contact 50 property owners resulting in 24 contracts to replace failing/illegal systems	CD, KDHE, NRCS, KSRE, SCC, LEPC

Goal 3: Manage grazing lands to reduce erosion to reach water quality goals of DO > 5mg/L, BOD< 3.5mg/L, TDS< 808mg/L, and TSS< 101mg/L, fecal coliform bacteria (originating from livestock) to ≤ 200cfu/100ml for swimming, and ≤ 2,000cfu/100ml for boating and fishing in water bodies of the watersheds.

- 677,055 acres grassland in Big Creek and Middle Smoky Hill watersheds that can use additional BMPs

Implementation of BMPs	Actions in support of BMP implementation	Time frame	Estimated cost	Implementation Targets	Cooperating Agencies
3.1 Improve vegetation and cover by focusing on proper livestock distribution, control of invasive species and re-establishment of grass cover.	Cost share programs	2005-2015	\$19,400.00 (\$25.00/acre for chemicals sprayed on 160 acres, \$1.50/acre for burning 1,000 acres, \$.25/tree for removal of cedars on 300 acres, \$80.00/acre for reseeding 80 acres of grassland)	Target: Develop 10 rangeland management plans per year.	KSRE, NRCS, CD, SCC
3.2 Develop drought management plans	Cost share programs	2005-2015	\$67,705.00 (\$0.10 per acre of grassland)	Target: Develop 10 drought management plans for landowners per year.	KSRE, NRCS, SCC, CD
3.3 Relocate water sources away from streams/ponds	Cost share programs	2005-2015	\$30,000.00 (\$3,000.00 per alternative powered water system ^b)	Target: Contact 45 landowners per year resulting in contracts for 10 projects per year	CD, KDHE, NRCS, KSRE, SCC
3.4 Implement management practices intended to minimize time livestock spend in or around water source	Cost share programs	2005-2015	\$1,229,184.00 (\$1.20/ft. for 97 stream miles ^b)	Target: Improve riparian area along 97 miles of streams, ponds, lakes, and water bodies per year	CD, KDHE, NRCS, KSRE, SCC

Goal 4: Reduce pollutants from urban areas to reach water quality goals of 0mg/L pesticides and hazardous waste, fecal coliform bacteria $\leq 200\text{cfu}/100\text{ml}$ for swimming, and $\leq 2,000\text{cfu}/100\text{ml}$ for boating and fishing, nitrate concentration $\leq 1.02\text{mg}/\text{L}$, and phosphorus concentration $\leq 0.26\text{mg}/\text{L}$ in rivers and lakes

- 81,791 acres of urban area that can use education to prevent pesticide, hazardous waste, fertilizer and pet waste runoff

Implementation of BMPs	Actions in support of BMP implementation	Time frame	Estimated cost	Implementation Target	Cooperating Agencies
4.1 Reduce pesticide and fertilizer usage	Education in proper application of pesticide and fertilizer use, and importance of soil testing	2005-2015	\$124,444.00 (\$2.00 per person living in watershed)	Target: Contact 10% of the population per year	KSRE, KDHE, Counties, Cities, RWD
4.2 Reduce household hazardous waste including chemicals, batteries, composting and collection sites	Provide access to household hazardous waste disposal sites	2005-2015	\$62,222.00 (\$1.00 per person living in the watershed)	Target: Establish four collection sites in the watersheds (existing county wide waste, recycling, and composting sites are included in Appendix B.).	KSRE, KDHE Counties, Cities, RWD
4.3 Proper disposal of pet waste	Signs in parks, veterinarian clinics, animal shelters, and pet groomers describing proper pet waste disposal	2005-2015	\$7,800.00 (\$100.00/sign ^b)	Target: 48 signs in parks, 30 in veterinary clinics, animal shelters, and pet groomers.	KSRE, KDHE, Cities, Veterinarians, Animal Shelters, Pet Groomers
4.4 Decrease fertilizer runoff from golf courses	Install buffers and waterways, record keeping, soil testing, and education on use of fertilizers	2005-2015	(\$4,200.00) (\$300/golf course for education and \$300/golf course for soil sampling ^b)	Target: Seven golf courses in watershed	KSRE, KDHE, Area golf courses

Goal 5: Develop a nutrient management plan

- All farms in Big Creek and Middle Smoky Hill watershed can use a nutrient management plan

Implementation of BMPs	Actions in support of BMP implementation	Time frame	Estimated cost	Implementation Targets	Cooperating Agencies
5.1 Education and implementation of proper BMPs	Proper nutrient application, applying to several fields, adjusting application practices.	2005-2015	\$62,222.00 (\$1.00 per person living in the watershed)	Target: Contact 10% of farms in watershed.	KSRE, NRCS, SCC, KDHE

5.2 Host a fertility/nutrient management school, demonstration sites, one-on-one meetings, and whole farm plans	Education on performing soil tests, enforcing private pesticide license for restricted chemicals, education aimed at dealers/crop consultants.	2005-2015	\$62,222.00 (\$1.00 per person living in the watershed)	Target: Contact 10% of farms in watershed.	KSRE, NRCS, SCC, KDHE
Goal 6: Reduce or eliminate illegal dumping of sewage and trash					
Implementation of BMPs	Actions in support of BMP implementation	Time frame	Estimated cost	Implementation Targets	Cooperating Agencies
6.1 Educate tourists about proper disposal of sewage and trash	Provide highly visible signs at key areas (roadside parks, bridges, historical markers), alert media attention to the problem	2005-2015	\$16,000.00 (\$100.00 per sign ^b)	Target: Place 160 signs in key areas	KSRE, KDHE, Counties, KDWP
6.2 Enforce laws and fines against improper dumping offenders	Insist on law enforcement of existing laws, and educate public on procedures to report offenders.	2005-2015	\$62,222.00 (\$1.00 per person living in the watershed)	Target: Contact 10% of the persons living in the watershed per year.	KSRE, KDHE, Counties, Cities, Law Enforcement
6.3 Provide brochures for travel centers, rest areas, and Annual State/National RV Show/Reunion in Hutchinson	Design brochure and distribute	2005-2015	\$5,000.00 ^b	Target: Distribute brochure to maximum number of key areas and events.	KSRE, KDHE, KDWP

Goal 7: Provide storm water management for urban and transportation

Implementation of BMPs	Actions in support of BMP implementation	Time frame	Estimated cost	Implementation Targets	Cooperating Agencies
7.1 Cooperate with communities to implement storm water management designs and plans and educate community residents.	Yearly meeting discussing newest research in storm water management with city and county governments. Meetings and activities to educate residents.	2005-2015	\$1,000.00 (Cost of annual meeting) \$62,222.00 (\$1.00 per person living in the watershed)	Target: Implementation of new methods of storm water control and maintenance of existing control measures. Providing educational material and activities to residents.	KSRE, City and County Governments
7.2 Cooperation with County Road and Bridge Departments for proper reseeding of roadsides after road elevation to prevent erosion.	Cost share program	2005-2015	\$8,400.00 (\$120.00 per mile for native grass and brome mixture ^b)	Target: Reseed all roadsides after construction work completed by county road crews	NRCS, CD, KSRE, KDHE, Counties
7.3 Cooperate with County Road and Bridge Departments on proper culvert location to decrease erosion.	Yearly meeting discussing newest practices of roadside conservation with county commissioners and road departments.	2005-2015	\$1,000.00 (Cost of annual meeting)	Target: Decrease soil erosion by improving conservation practices along new road construction and existing road right of ways.	NRCS, CD, KSRE, KDHE, Counties
7.4 Cooperate with County Road and Bridge Departments to provide adequate ditch drainage areas	Yearly meeting discussing newest practices of roadside conservation with county commissioners and road departments.	2005-2015	\$1,000.00 (Cost of annual meeting)	Target: Decrease soil erosion by improving conservation practices along new road construction and existing road right of ways.	NRCS, KSRE, CD, Counties

7.5 Cooperate with City of Hays on educational efforts in meeting the requirements of their NPDES Phase II permit	Quarterly meetings with City of Hays to discuss educational efforts. Carry-out educational events and activities.	2005-2015	\$20,013.00 (\$1.00 per person living in Hays)	Target: Provide educational material and activities to residents. Build awareness on stormwater management issues within the City of Hays.	KSRE, KDHE, CD, City of Hays
Goal 8: Manage oil wells and oil fields concerning saltwater disposal, plugging abandoned wells, cleanliness at drilling sites, and sludge spread on leased roads.					
Implementation of BMPs	Actions in support of BMP implementation	Time frame	Information Concerning Remediation, Regulations, and Public Education		Cooperating Agencies
8.1 Enforcement of existing laws by Kansas Corporation Commission	Funding from KCC provided by a mill levy on oil and gas production	2005-2015	Phone and address information for District Offices listed in Appendix A.		KCC, KSRE, NRCS, SCC, KDHE
8.2 Remediation of brine scars and saltwater leaks (soil sampling, addition of soil amendments, re-vegetation, and irrigation)	Funding from oil companies	2005-2015	Site specific remediation planner located on KCC website: http://www.kcc.state.ks.us/conservation/scar/index.htm		KCC, KSRE, NRCS, SCC, KDHE
8.3 Educate drillers and oil companies concerning best management practices.	Funding from KCC provided by a mill levy on oil and gas production	2005-2015	Regulation of oil companies and drillers provided by KCC. Phone and address information for District Offices listed in Appendix A.		KCC, KSRE, NRCS, SCC, KDHE
8.4 Educate public on existing laws and rights for oil drillers and companies	Newsletters and tours	2005-2015	Estimated cost of education = \$62,222.00 (\$1.00 per person living in the watershed)		KCC, KSRE, NRCS, SCC, KDHE

^a Reference to the following publication unless in-text reference. *Water Quality Best Management practices, Effectiveness and Cost for Reducing Contaminant Losses from Cropland*, Daniel Devlin, et.al., Kansas State University, February, 2003. See Appendix B.

^b Amount estimated from Watershed Specialist, SCC Funded Projects, District Conservationists, and County Sanitarians

Key:

KSRE=Kansas State Research and Extension

NRCS=Natural Resources Conservation District

SCC=State Conservation Commission

CD=Conservation Districts

KDHE=Kansas Department of Health and Environment

RWD=Rural Water Districts

KDWP=Kansas Wildlife and Parks

LEPG = Local Environmental Protection Agency

KDOT=Kansas Department of Transportation

KCC=Kansas Corporation Commission

Section 5

Appendices

A. List of Organizations and Agencies

B. Tables, Information, and Public Participation

- 1) Watershed and Statewide Pollutant Averages**
- 2) Modeling data for Kanopolis Watershed**
- 3) Past and Currently Funded Projects with Estimated Associated Costs**
- 4) Public Participation Activities**
- 5) Tour, Field Day, Meeting, and Seminar Flyers, Newspaper Articles**

C. Agency Reports and Publications

- 1) Water Quality Best Management Practices, Effectiveness, and Cost for Reducing Contaminant Losses from Cropland**
- 2) Water Condition Reports**
 - Big Creek**
 - Middle Smoky Hill River**
- 3) Status Report 2002, State of Kansas**
- 4) Kansas Water Plan 2003, Smoky Hill - Saline Basin Section**
- 5) Kansas Water Plan Supplement 2004, Smoky Hill – Saline Basin Section**
- 6) TMDLs for Smoky Hill – Saline Basin**

Appendix A

List of Organizations and Agencies

Table 12. State and Federal Organizations and Agencies

Organization	Program	Purpose	Phone	Website address
Kansas Dept. of Agriculture	Watershed District Program Multipurpose Small Lakes	Available for watershed districts and small lakes development.	785-296-2933	www.accesskansas.org/kda
Kansas Dept. of Health and Environment	Nonpoint Source Pollution Program State Revolving Loan Fund	Provide funds for projects that will reduce nonpoint source pollution. Makes low interest loans for projects to improve and protect water quality.	785-296-3600 785-296-3600	www.kdhe.state.ks.us
Kansas Water Office	Public Information and Education	Provide information and education to the public on Kansas Water Resources	785-296-3185	www.kwo.org
Environmental Protection Agency	Clean Water State Revolving Fund Program Watershed Protection	Provides low cost loans to communities for water pollution control activities. To conduct holistic strategies for restoring and protecting aquatic resources based on hydrology rather than political boundaries.	913-551-7003 913-551-7003	www.epa.gov

State Conservation Commission	Water Resources Cost Share	Provide cost share assistance to landowners for establishment of water conservation practices.	785-296-3600	www.accesskansas.org/ksc
	Nonpoint Source Pollution Control Fund	Provides financial assistance for nonpoint pollution control projects which help restore water quality.		
	Riparian and Wetland Protection Program	Funds to assist with wetland and riparian development and enhancement.		
	Stream Rehabilitation Program	Assist with streams that have been adversely altered by channel modifications.		
	Kansas Water Quality Buffer Initiative	Compliments Conservation Reserve Program by offering additional financial incentives for grass filters and riparian forest buffers.		
Kansas Alliance for Wetlands and Streams	Streambank Stabilization Wetland Restoration Cost share programs	The Kansas Alliance for Wetlands and Streams (KAWS) organized in 1996 to promote the protection, enhancement, restoration and establishment wetlands and streams in Kansas.	620-241-3636	www.kswetland.org

Kansas State Research and Extension	Water Quality Programs, Kansas Center for Agricultural Resources and Environment (KCARE)	Provide programs, expertise and educational materials that relate to minimizing the impact of agriculture on water quality.	785-532-7103	www.oznet.ksu.edu/kcare/org
	Kansas Environmental Leadership Program (KELP)	Educational program to develop leadership for improved water quality.	785-532-5813	www.oznet.ksu.edu/kelp
	Kansas Local Government Water Quality Planning and Management	Provide guidance to local governments on water protection programs.	785-532-2643	www.oznet.ksu.edu/olg
	Waste Management Programs, Kansas Center for Agricultural Resources and Environment (KCARE)	Provides best management practices for handling waste materials of all types.	785-532-7103	www.oznet.ksu.edu/kcare/org
Kansas Forest Service	Conservation Tree Planting Program	Provides low cost trees and shrubs for conservation plantings.	785-532-3312	www.kansasforests.org
	Riparian and Wetland Protection Program	Work closely with other agencies to promote and assist with establishment of riparian forestland.	785-532-3310	

Kansas Department of Parks and Wildlife	Land and Water Conservation Funds	Provides funds to preserve develop and assure access to outdoor recreation.	620-672-5911	www.kdwp.state.ks.us/about/grants.html
	Conservation Easements for Riparian and Wetland Areas	To provide easements to secure and enhance quality areas in the state.	785-296-2780	
	Wildlife Habitat Improvement Program	To provide limited assistance for development of wildlife habitat.	620-672-5911	
	North American Waterfowl Conservation Act	To provide up to 50 percent cost share for the purchase and/or development of wetlands and wildlife habitat.	620-342-0658	
	MARSH program	May provide up to 100 percent of funding for small wetland projects.	620-672-5911	
US Army Corps of Engineers	Planning Assistance to States	Assistance in development of plans for development, utilization and conservation of water and related land resources of drainage	816-983-3157	www.usace.army.mil
	Environmental Restoration	Funding assistance for aquatic ecosystem restoration.	816-983-3157	
US Fish and Wildlife Service	Fish and Wildlife Enhancement Program	Supports field operations which include technical assistance on wetland design.	785-539-3474	www.fws.gov
	Private Lands Program	Contracts to restore, enhance, or create wetlands.	785-539-3474	

USDA- Natural Resources Conservation Service and Farm Service Agency	Conservation Compliance	Primarily for the technical assistance to develop conservation plans on cropland.	785-823-4565	www.ks.nrcs.usda.gov
	Conservation Operations	To provide technical assistance on private land for development and application of Resource Management Plans.	785-823-4565	
	Watershed Planning and Operations	Primarily focused on high priority areas where agricultural improvements will meet water quality objectives.	785-823-4565	
	Wetland Reserve Program	Cost share and easements to restore wetlands.	785-823-4565	
	Wildlife Habitat Incentives Program	Cost share to establish wildlife habitat which includes wetlands and riparian areas.	785-823-4565	
	Grassland Reserve Program, EQIP, and Conservation Reserve Program	Improve and protect rangeland resources with cost-sharing practices, rental agreements, and easement purchases.		
Kansas Rural Center	The Heartland Network Clean Water Farms Project Sustainable Food Systems Project Cost share programs	The Center is committed to economically viable, environmentally sound and socially sustainable rural culture.	913-873-3431	http://www.ibiblio.org/farming-connection/localcon/groups/kansasasrc.htm

Smoky Hills Resource Conservation & Development Area Central Prairie Resource Conservation & Development	Land Conservation	Promotes conservation, development, and use of natural resources, improves the general level of economic activity, and enhances the environment and standard of living in communities.	785-222-2615	http://www.nrcs.usda.gov/programs/rcd/
	Water Management Community Development Land Management Elements		785-823-4568	

Table 13. Regional Organizations and Agencies and Contact Information

Organization	Contact Person	Phone	Email address
Kansas State Research and Extension	Stacie Minson, Watershed Specialist	785-628-3081 Ext. 334	sedgett@oznet.ksu.edu
	Richard Snell, Barton County Extension Agent	620-793-1910	rsnell@oznet.ksu.edu
	Stacy Campbell, Ellis County Extension Agent	785-628-9430	scampbel@oznet.ksu.edu
	Brent Goss, Ellsworth County Extension Agent	785-472-4442	bgoss@oznet.ksu.edu
	Cathy Musick, Gove County Extension Director	785-938-4480	cmusick@oznet.ksu.edu
	Scott Chapman, Lincoln County (Post Rock District) Extension Agent	785-738-3597	schapman@oznet.ksu.edu
	Grant Richardson, Ness County(Walnut Creek District) Extension Agent	785-798-3921	grichard@oznet.ksu.edu
	David Coltrain, Rush County (Walnut Creek District) Extension Agent	785-222-2710	coltrain@oznet.ksu.edu
	John Stannard, Russell County Extension Agent	785-483-3157	jstannar@oznet.ksu.edu
	Amy Taylor, Trego County Extension Director	785-743-6361	amtaylor@oznet.ksu.edu

Natural Resources Conservation Service	Gregory Bauer, Barton County District Conservationist	620-792-3346	gregory.bauer@ks.usda.gov
	Layton Billips, Gove County District Conservationist	785-938-2365	layton.billips@ks.usda.gov
	Ken Urban, Ellis County District Conservationist	785-628-3081	ken.urban@ks.usda.gov
	Phillip Chegwiddden, Ellsworth County District Conservationist	785-472-4259	phillip.chegwiddden@ks.usda.gov
	Monty Breneman, Lincoln County District Conservationist	785-524-4482	monty.breneman@ks.usda.gov
	Sharla Schwien, Ness County District Conservationist	785-798-3911	sharla.schwien@ks.usda.gov
	Andy Phelps, Russell County District Conservationist	785-483-2826	andy.phelps@ks.usda.gov
	Michael Grogan, Trego County District Conservationist	785-743-2191	michael.grogan@ks.usda.gov
	Rodney Marcotte, Rush County District Conservationist	785-222-2615	rodney.marcotte@ks.usda.gov

Conservation Districts	Pamela Tucker, Barton County CD Manager/Water Quality Coordinator	620-792-3346	1520 Kansas Ave. Great Bend, KS 67530
	Pat Chapin, Gove County CD Manager/Water Quality Coordinator	785-938-2365	318 Broad Street Gove, KS 67738
	Sandra Scott, Ellis County CD Manager/Water Quality Coordinator	785-628-3081	2715 Canterbury Dr. Hays, KS 67601
	Brad Kratzer, Ellsworth County CD Water Quality Coordinator	785-472-4259	402 W. 15 th Street, Suite 1 Ellsworth, KS 67439
	Patricia Winters, Lincoln County CD Manager/Water Quality Coordinator	785-524-4482	112 East Court Lincoln, KS 67455
	Nathella Humburg, Ness County CD Manager/Water Quality Coordinator	785-798-3911	Hwy 283 and Airport Rd. Ness City, KS 67560
	Donna Fay Major, Russell County CD Manager/Water Quality Coordinator	785-483-2826	555 S Fossil P O Box 73 Russell, KS 67665
	Judy Kreutzer, Trego County CD Manager/Water Quality Coordinator	785-743-2191	519 Russell Ave. WaKeeney, KS 67672
	Stephanie Royer, Rush County CD Manager/Water Quality Coordinator	785-222-2615	1515 Oak Street Lacrosse, KS 67548

Kansas Corporation Commission

The KCC shall regulate rates, service and safety of public utilities, common carriers, motor carriers, and regulate oil and gas production by protecting correlative rights and environmental resources.

District	Contact Person	Phone	Address
District 1 (serving Ness and Rush counties)	Steve Durant, District Office Supervisor	620-225-8888	210 E. Frontview, Suite A Dodge City, KS 67801
District 2 (serving Ellsworth and Lane counties)	Doug Louis, District Office Supervisor Jeff Klock, Bill Johnson, Remediation Geologists	316-630-4000	3450 N. Rock Road Building 600, Suite 601 Wichita, KS 67226
District 3 (serving Gove, Trego, Ellis, Russell, and Barton counties)	Herb Deines, District Office Supervisor Bruce Bayse, Remediation Geologist	785-625-0550	2301 E. 13 th Street Hays, KS 67601

Appendix B

Watershed and Statewide Pollutant Averages

Modeling data for Kanopolis Watershed

Past and Currently Funded Projects with Estimated Associated Costs

Public Participation

**Tour, Field Day, Meeting, and Seminar Flyers, Photographs, Newspaper Articles, and
Extension Bulletins**

Watershed and statewide pollutant averages

Table 14. Watershed and statewide averages for various pollutants

Watershed	Watershed Average	Statewide Average
Fecal Coliform Bacteria		
Big Creek	2,579cfu/100ml water	1,422cfu/100ml water
Middle Smoky Hill	938cfu/100ml water	1,422cfu/100ml water
Chloride		
Big Creek	253mg/L	NA
Middle Smoky Hill	365mg/L	NA
Sulfate		
Middle Smoky Hill	220mg/L	NA
Eutrophication		
Big Creek	Nitrate 1.61mg/L Phos 0.63mg/L BOD 4.1mg/L	Nitrate 1.02mg/L Phos 0.26mg/L BOD 3.5mg/L
Middle Smoky Hill	Nitrate .58mg/L Phos 0.32mg/L BOD 3.6mg/L	Nitrate 1.02mg/L Phos 0.26mg/L BOD 3.5mg/L
Siltation		
Middle Smoky Hill	TDS 1,135mg/L TSS 105mg/L	TDS 808mg/L TSS 101mg/L

Source: Kansas Nonpoint Source Pollution Management Plan and KDHE TMDL Report

Key:

cfu=colony forming units
ml=milliliters
mg/L=milligrams per liter or parts per million
BOD=Biological Oxygen Demand
TDS=Total Dissolved Solids
TSS=Total Suspended Solids

Table 15. Modeling data for the Kanopolis Lake watershed

SWAT results for Kanopolis Watershed using the "current" (1992 data) distribution of landuses. [Date of analyses: 30 March 2005]

Period of simulation: 1992-2001.

Native Grass simulation has all grasses, with 5 regionally appropriate native grasses decreasing in veg. density from E to W. Currently, grasses are harvested (we are evaluating this).

CT (conventional-tillage system), RT (reduced-tillage system), and NT (not-till system) use typical field operations for wheat-sorghum-fallow rotation.

Filter strips of 5m and 10m were applied to all cropland area. Linear interpolation is reasonable to estimate effects of buffers on fractional cropland area.

Stream processes have not been calibrated. Manure from grazing livestock is included, but no land application of confined livestock manure.

**Source: Kyle Mankin
147 Seaton**

**Biological and Agricultural Engineering
Kansas State University
Manhattan KS 66506**

Overland (this is the annual pollutant load that leaves the field, averaged across all land areas with the land use noted)									
	Surface Runoff, mm	Sediment Load, Mg/ha	Org. N, kg/ha	NO ₃ in SURQ, kg/ha	Org. P, kg/ha	Sol. P, kg/ha	Sed. P, kg/ha	Total N, kg/ha	Total P, kg/ha
Native Grass	30.2	1.17	2.25	0.08	0.27	0.00	0.09	2.33	0.36
CT	39.3	3.99	7.96	0.12	1.00	0.02	0.33	8.09	1.35
CT-10m	39.3	0.58	1.44	0.05	0.18	0.01	0.06	1.49	0.25
CT-5m	39.3	0.80	2.06	0.07	0.26	0.01	0.08	2.12	0.35
RT	41.3	2.81	5.83	0.13	0.76	0.02	0.24	5.96	1.02
RT-10m	41.3	0.43	1.11	0.06	0.15	0.01	0.04	1.17	0.19
RT-5m	41.3	0.59	1.56	0.07	0.20	0.01	0.06	1.64	0.27
NT	43.9	1.21	3.29	0.14	0.45	0.02	0.14	3.43	0.62
NT-10m	43.9	0.41	1.04	0.06	0.14	0.01	0.04	1.10	0.19
NT-5m	43.9	0.56	1.46	0.08	0.20	0.01	0.06	1.53	0.27

←baseline→

Overland: % reduction in pollutant loads from conventional-till-no-buffer scenario				
	Surface Runoff	Sediment load	Total N	Total P
Native Grass	23	71	71	73
CT	0	0	0	0
CT-10m	0	86	82	82
CT-5m	0	80	74	74
RT	-5	29	26	24
RT-10m	-5	89	86	86
RT-5m	-5	85	80	80
NT	-12	70	58	54
NT-10m	-12	90	86	86
NT-5m	-12	86	81	80

Watershed Outlet (this is the annual pollutant yield that enters Kanopolis Lake)									
	Flow, m ³ /s	Sediment yield, Mg	Org. N, kg	NO ₃ N, kg	NH ₄ , kg	NO ₂ , kg	Org. P, kg	Mineral P, kg	Total P, kg
Native Grass	10.36	249900	121700	857300	90200	34890	11230	170300	1104090
CT	12.81	710000	212800	3369000	219100	96380	16310	688700	3897280
CT-10m	12.81	264500	52350	731500	50660	22040	4659	151100	856550
CT-5m	12.81	337000	63240	987000	63870	27950	5399	201700	1142060
RT	13.31	652300	161200	2531000	168000	73030	12750	530600	2933230
RT-10m	13.29	211200	46850	599000	44300	19000	4303	126800	709150
RT-5m	13.29	274200	55000	789600	54230	23370	4865	165500	922200
NT	13.90	435300	81960	1563000	88440	38210	6830	337500	1771610
NT-10m	13.90	204400	45090	589600	42260	18090	4243	129400	695040
NT-5m	13.90	265100	51980	768700	50860	21840	4729	167800	893380

Watershed Outlet: % reduction in pollutant loads from conventional-till-no-buffer scenario				
	Flow	Sediment load	Total N	Total P
Native Grass	19	65	72	74
CT	0	0	0	0
CT-10m	0	63	78	78
CT-5m	0	53	71	71
RT	-4	8	25	23
RT-10m	-4	70	82	81
RT-5m	-4	61	76	76
NT	-9	39	55	51
NT-10m	-9	71	82	81
NT-5m	-9	63	77	76

Past and current funding of educational programs and implementation of BMPs

Table 16. Big Creek 319 Funded Projects (Kansas Department of Health and Environment)

Project	Cooperator	Funding
Hays Wellhead Protection Area Monitoring	City of Hays	\$24,200
Public Education for Wellhead Protection and Household Hazardous Waste	City of Hays	\$6,295

Source: KDHE

Table 17. Middle Smoky Hill 319 Funded Projects (Kansas Department of Health and Environment)

Project	Cooperator	Funding
Kanopolis Lake-Smoky Hill River Watershed Water Quality Protection	Post Rock Rural Water District	\$24,424
Kanopolis Lake-Smoky Hill River WRAPS	Post Rock Rural Water District	\$25,424
Kanopolis Watershed Assessment, Part 1	Kansas State University	\$20,000
Kanopolis Watershed Assessment, Part 1	Kansas State University	\$77,346
Kanopolis Watershed Assessment, Part 1	Kansas State University	\$23,400
Kanopolis Watershed Assessment, Part 2	Kansas State University	\$131,175
Kanopolis Watershed Water Quality Project, Part 1	Post Rock Rural Water District	\$12,360
Rush County Water Quality Project-Livestock Waste Management	Rush County conservation District	\$16,355

Source: KDHE

Table 18. Big Creek Watershed State Conservation Commission Funded Projects FY 2004

Project Code	Number or Size of Projects	Type of Project	Funds
007	9 projects	Abandoned Water Well Plugging	\$2,158.51
110	20 projects	On-site Wastewater System	\$23,450.33
342	4.61 acres	Critical Area Planting	\$187.93
412r	2.95 acres	Grassed Waterway Restoration	\$1,619.55
412	3.33 acres	Grasses Waterway or Outlet	\$1,855.32
512	80.3 acres	Pasture and Hayland Planting	\$2,084.81
516	600 linear ft.	Pipeline	\$504.00
550	59.8 acres	Range Planting	\$1,612.10
600	13,177 linear ft.	Terrace	\$4,251.30

600r	32,229 linear ft.	Terrace Restoration	\$5,202.95
614	3 projects	Trough or Tank	\$1,037.20
642	2 projects	Well - Livestock	\$1,466.40
Total			\$45,430.40

Source: State Conservation Commission

Table 19. Middle Smoky Hill Watershed State Conservation Commission Funded Projects FY 2004

Project Code	Number or Size of Projects	Type of Project	Funds
007	11 projects	Abandoned Water Well Plugging	\$3,461.58
110	21 projects	On-site Wastewater System	\$30,442.37
342	15.1 acres	Critical Area Planting	\$621.60
378	4 projects	Ponds	\$8,778.66
380	1 project	Windbreak/Shelterbelt Establishment	\$234.50
391	1 project	Riparian Forest Buffer	\$694.12
412r	8.82 acres	Grassed Waterway Restoration	\$4,944.61
412	5.5 acres	Grasses Waterway or Outlet	\$3,007.78
484	9,900 linear feet	Mulching	\$3,603.60
512	23.5 acres	Pasture and Hayland Planting	\$997.72
516	1,300 linear ft.	Pipeline	\$454.63
521b	300 square feet	Pond Sealing or Lining - Bentonite	\$178.50
550	26 acres	Range Planting	\$407.99
574	4 projects	Spring Development	\$5,886.23
580	1 project	Streambank and Shoreline Protection	\$16,496.08
590	9 projects	Nutrient Management	\$63.85
600	124,558 linear feet	Terrace	\$32,494.62
600r	34,441 linear feet	Terrace Restoration	\$7,290.33
614	6 projects	Water Trough or Tank	\$2,826.73
642	5 projects	Livestock Well	\$5,846.04

Total			\$128,731.54
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Source: State Conservation Commission

Environmental Quality Incentive Program (EQIP) Funded Projects

EQIP is a joint program between the United States Department of Agriculture and the Natural Resources Conservation Service to provide financial incentives for farmers that participate in Integrated Pest Management (IPM) or design and execute a Nutrient Management Plan. IPM is a system designed to develop and implement economical, environmentally friendly and innovative methods of pest control. The goal of IPM is to increase farm profitability, reduce environmental and human health risks, and protect natural resources. A Nutrient Management Plan involves meeting NRCS specifications of applying nutrients at the proper rate, in the proper form, and at the proper time in order to minimize nutrient runoff and loss. Nutrients can either be applied in commercial fertilizer form or animal waste form. There are no EQIP activities in the Big Creek watershed. However, Middle Smoky Hill watershed has activity in Nutrient Management and Pest Management (see Table 18).

Table 20. Number of EQIP Acres in Middle Smoky Hill Watershed

	FY 2002	FY 2003	FY 2004
Nutrient Management-commercial fertilizer	2,269 acres	545 acres	0
Nutrient Management-animal waste	238 acres	0	86 acres
Pest Management	755 acres	0	155 acres

Source: Natural Resources Conservation Service

Table 21. County Household Hazardous Waste, Recycling, and Composting Programs Currently Available (October 12, 2004)

County	Household Hazardous Waste		Recycling	Composting
	Availability	Dates	Availability	Availability
Barton	Yes - city and county residents	3 rd Saturday each month, March to October	None	Cities of Great Bend, Ellinwood, and Hoisington
Ellis	Yes - city and county residents	Ellis County Landfill. Monday to Saturday, 8am to 6pm (5gal or 50# limit/person). Approval for large quantities, call: 785-628-9449.	Yes - city pickup and county residents may bring material to recycling building	Yes -, open to city and county residents
Ellsworth	None		Yes - recycling trailer is brought to the cities for pickup	Yes - open to city and county residents

Gove	Yes – in conjunction with Ellis, Rush, Russell, and Trego Counties.	Twice per year	Yes - open to city and county residents	None
Lincoln	None		Yes – open to city and county residents	Yes – open to city and county residents
Ness	Yes	Once per year	Yes – recycling trailer is brought to the cities for pickup	City compost piles for Ness City and Bazine residents only
Rush	Yes – in conjunction with Gove, Ellis, Russell, and Trego Counties.	Twice per year	Yes – open to city and county residents	None
Russell	Yes – in conjunction with Gove, Ellis, Rush, and Trego Counties.	Twice per year	Yes – open to city and county residents	None
Trego	Yes – in conjunction with Gove, Ellis, Rush, and Russell, Counties.	Trego County Landfill: Monday – Saturday, 9am to 5pm	Yes – open to city and county residents	Yes – open to city and county residents


Source: Douglas Schneweis, Watershed Field Coordinator

Public Participation

Table 22. Big Creek and Middle Smoky Hill Public Participation Activities

Event	Watershed	Cooperating Agencies	Explanation of Event	Location	Date	Number Attending
Big Creek Watershed Tour	BC	SHRTF, KSRE	Tours: Hays Medical Center storm management center, Hays Feeders, Ellis city residential development, Wellhead protection area, Hays groundwater remediation site. Presentations: Importance of water quality, Problems of water quality, Promoting watershed issues, BMPs to protect water quality.	Hays	09/17/03	80
Middle Smoky Hill Watershed Tour	MSH	KSRE, SHRTF	Tours: Post Rock RWD treatment plant at Lake Kanopolis, Streambank stabilization project, Riparian buffer strip, USGS water monitoring station, 4S Feeders Presentations: Importance of water quality, Problems of water quality, Promoting watershed issues, BMPs to protect water quality.	Ellsworth, Hays, Russell, and Ellis counties	09/17/03	80
Ellis Trego Pork Producers Meeting	BC	KSRE	Discuss EQIP and TMDLs in the watershed	WaKeeney	11/25/03	17
Carrico Implement Open House	BC, MSH	KSRE	Display on water quality and TMDLs	Hays	12/12/03	150
KAYS Radio Spot, Eagle Radio	BC, MSH	KSRE	Role of watershed specialist and information available on water quality	Hays	12/19/03	Coverage of entire watershed

Ellis Co. CD District Annual Meeting	BC, MSH	Ellis Co. CD, NRCS, KSRE	Display on water quality. Presentation of Clean Water Pledge.	Hays	01/26/04	225
Library Story Hour	BC, MSH	KSRE	Activity on water pollution	WaKeeney	01/28/04	13
Russell Co. Beef Days	MSH	KSRE	ABCs of Water Quality Presentation – TMDLs and water quality.	Russell	02/06/04	100
Trego Co. CD Annual Meeting	BC, MSH	Trego CD, NRCS, KSRE	Water Quality Presentation focusing on conditions of watershed and TMDLs. Presentation of Clean Water Pledge. Survey of resource concerns: soil, water, air, and animal.	WaKeeney	02/09/04	100
Trego Co. Watershed Driving Tour	BC, MSH	NRCS, CD, KSRE, WQGLM	Driving tour to review watershed model.	Trego Co.	02/11/04	11
Ellis Co. Watershed Driving Tour	BC,MSH	NRCS, CD, KSRE, WQGLM	Driving tour to review watershed model.	Ellis Co.	02/12/04	8
Ellis Trego Pork Producers	BC, MSH	KSRE	Presentation on livestock website assessment tool for significant pollution potential	WaKeeney	02/12/04	22
Sustainable Ag Conference	BC	KSRE, KFB	ABCs of Water Quality Presentation – TMDLs and water quality	Hays	02/13/04	75
Russell Co. Watershed Driving Tour	MSH	NRCS, CD, KSRE, WQGLM	Driving tour to review watershed model.	Russell Co.	02/20/04	9
Ellsworth Co. Watershed Driving Tour	MSH	NRCS, CD, KSRE, WQGLM	Driving tour to review watershed model.	Ellsworth Co.	02/24/04	11
Ellis Co. Farm Bureau Farm Safety Day	BC, MSH	ELFB, KSRE	Presentation on FCB in livestock operations and BMPs.	Hays	03/02/04	175
WaKeeney Public Library	BC, MSH	KSRE	Children's activity on water pollution sources	WaKeeney	03/07/04	12
Hays Rotary Meeting	BC, MSH	KSRE	Presentation on the Clean Water Pledge program	Hays	03/15/04	75

Town Hall Conversation	BC	KSRE, CD, KDHE, SHRTF, FB	Learn about water quality issues facing Big Creek watershed.	Ellis	03/30/04	21
Trego County Health Fair	BC	KSRE	Share water quality issues facing Big Creek watershed	WaKeeney	04/14/04	250
Town Hall Conversation	MSH	KSRE, CD, KDHE, SHRTF, FB	Learn about water quality issues facing Middle Smoky Hill watershed.	Wilson	04/15/04	37
Water Wise Tours and Demonstrations	BC, MSH	KSRE, CD, FFA, NRCS, KDHE, SCC	<p>Tours: WaKeeney Water Wells, City of WaKeeney Waste Water Treatment Plant.</p> <p>Demonstrations:</p>  <p>Trego County Abandoned Well Plugging</p> <p>Presentations: Importance of Testing Private Wells, Septic Systems, Household Hazardous Waste, Recycling, Cost-share Programs Available.</p>	WaKeeney	04/27/04	30
Interagency Forum at Local Level	BC, MSH	KSRE, KWO, KDHE, CD,	Discussion of improving communications and relationships between agencies to enhance ability to serve clients.	Russell	04/29/04	19

KBSH TV Newstalk	BC, MSH	KSRE	Promotion of Town Hall Conversation meeting	Hays	04/30/04	Coverage of entire viewing area
KAYS Radio	BC, MSH	KSRE	Summer water quality issues	Hays	06/22/04	Coverage of entire broadcast area
Ellis Co. CD Newsletter	BC, MSH	KSRE, ELCD	"Evaluating Your Farmstead to Reduce NPS Pollution" and "Summer Water Quality and Livestock Performance"	Ellis Co.	July 2004	1,800
Basin Advisory Committee	BC, MSH	KWO	Presentation on livestock water installation	Hays	07/27/04	30
Clean Water Pledge Attainment	BC, MSH	KDHE	Pledge signed by local residents supporting the use of BMPs to assure the water that exits their property is free of pollutants.	Gove Co. Trego Co. Ellis Co. Russell Co. Ness Co. Rush Co.	Jan – April 2004	83 signed 103 signed 137 signed 13 signed 62 signed 12 signed
Trego County Fair Display	BC, MSH	KSRE	Display to increase awareness of the public concerning the impact of FCB on the watershed.	Trego Co.	07/18/04 to 07/21/04	300
Ellis Co, FB Kids Ag Day	BC, MSH	ELFB, KSRE	Activity teaching oil and water don't mix and NPS pollution.	Ellis Co.	09/09/04	350
WaKeeney Federated Club	BC, MSH	WaKeeney Federated Club	Presentation on TMDLs and homeowner BMPs	WaKeeney	09/10/04	11
KACD Meeting	BC, MSH	KACD, KSRE	Presentation on watershed educational efforts and programs	Colby	09/10/04	75

EARTH Program	MSH	USD, KSRE	EARTH training and curriculum distributed to schools within the watershed.	Hays	09/10/04	746
	BC	USD, KSRE	EARTH training and curriculum distributed to schools within the watershed.	Hays	09/13/04	662
Cooperative Efforts Meeting	BC, MSH	NRCS, CD, KSRE	Discussion of acreages and BMPs for WRAPS document.	Russell	09/29/04	14
Smoky Hill River Task Force Water Festival	BC, MSH	SHRTF, KSRE, EWCD	Water festival with hands-on activities focusing on water topics for 4 th graders.	Russell	10/05/04	525
Town Hall Conversations II	BC, MSH	KSRE, CD, KDHE, SHRTF, FB	Present WRAPS document	Russell Ellsworth Hays	10/28/04	89
Livestock Water and Waste Tour	BC, MSH	Dickinson Ranch, KSRE, SHRTF, SHRC&D, FB, KRC, NRCS, ELCD	Presentations: KDHE certification and permit process, Cost-share opportunities, and Livestock waterers. Tour: Livestock waste lagoon.	Hays	11/18/04	65
Feed, Forage, and Pasture Conference	BC	KSRE	Presentation of TMDLs and WRAPS	WaKeeney	11/30/04	54
Smoky Hill/Saline Basin Advisory Committee	BC, MSH	KSRE	Presentation of WRAPS document		12/08/04	29

Source: Stacie Minson, Watershed Specialist, KSRE

Key:

BC=Big Creek Watershed
KSRE=Kansas State Research and Extension
KDHE=Kansas Department of Health and Environment
FB=Farm Bureau
NRCS=Natural Resources Conservation Service
FHSU=Ft. Hays State University

MSH=Middle Smoky Hill Watershed
CD=Conservation District
SHRTF=Smoky Hill River Task Force
SCC=State Conservation Service
KWO=Kansas Water Office
FFA=High School Organization

WQGLM=Water Quality Grazing Lands Management Team
ELFB=Ellis County Farm Bureau
KACD=Kansas Association of Conservation Districts
EARTH=Earth Awareness Research for Tomorrow's Habitat

KFB=Kansas Farm Bureau
ELCD=Ellis County Conservation District
USD=Unified School District